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Lai et al.

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(54) **OPTICAL IMAGE CAPTURING SYSTEM**

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Mar. 24, 2016 (TW) .... 105109252 A

(51) **Int. Cl.**

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G02B 3/02	(2006.01)
G02B 9/34	(2006.01)
G02B 13/00	(2006.01)
G02B 5/00	(2006.01)
G02B 5/20	(2006.01)
G02B 7/08	(2006.01)
G02B 27/00	(2006.01)

(52) **U.S. Cl.**
CPC ***G02B 13/004*** (2013.01); ***G02B 5/005*** (2013.01); ***G02B 5/208*** (2013.01); ***G02B 7/08*** (2013.01); ***G02B 9/34*** (2013.01); ***G02B 27/0025*** (2013.01)

(58) **Field of Classification Search**
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USPC 359/715, 753, 771–783
See application file for complete search history.

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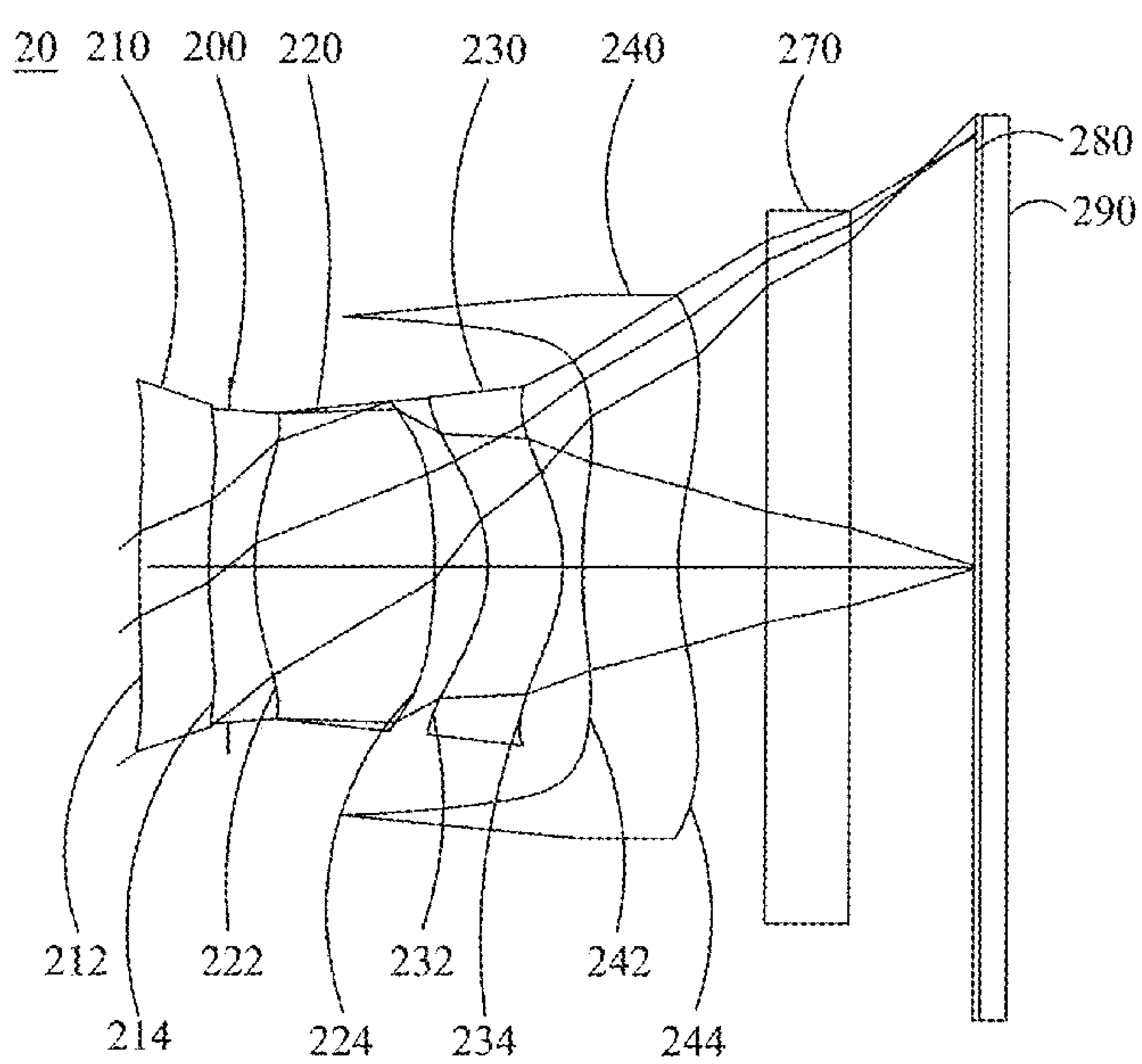
(57) **ABSTRACT**

An optical image capturing system, sequentially including a first lens element, a second lens element, a third lens element and a fourth lens element from an object side to an image side, is provided. The first lens element has negative refractive power. The second through third lens elements have refractive power. The fourth lens element has positive refractive power. At least one of the image-side surface and the object-side surface of each of the four lens elements are aspheric. The optical lens elements can increase aperture value and improve the imagining quality for use in compact cameras.

25 Claims, 20 Drawing Sheets



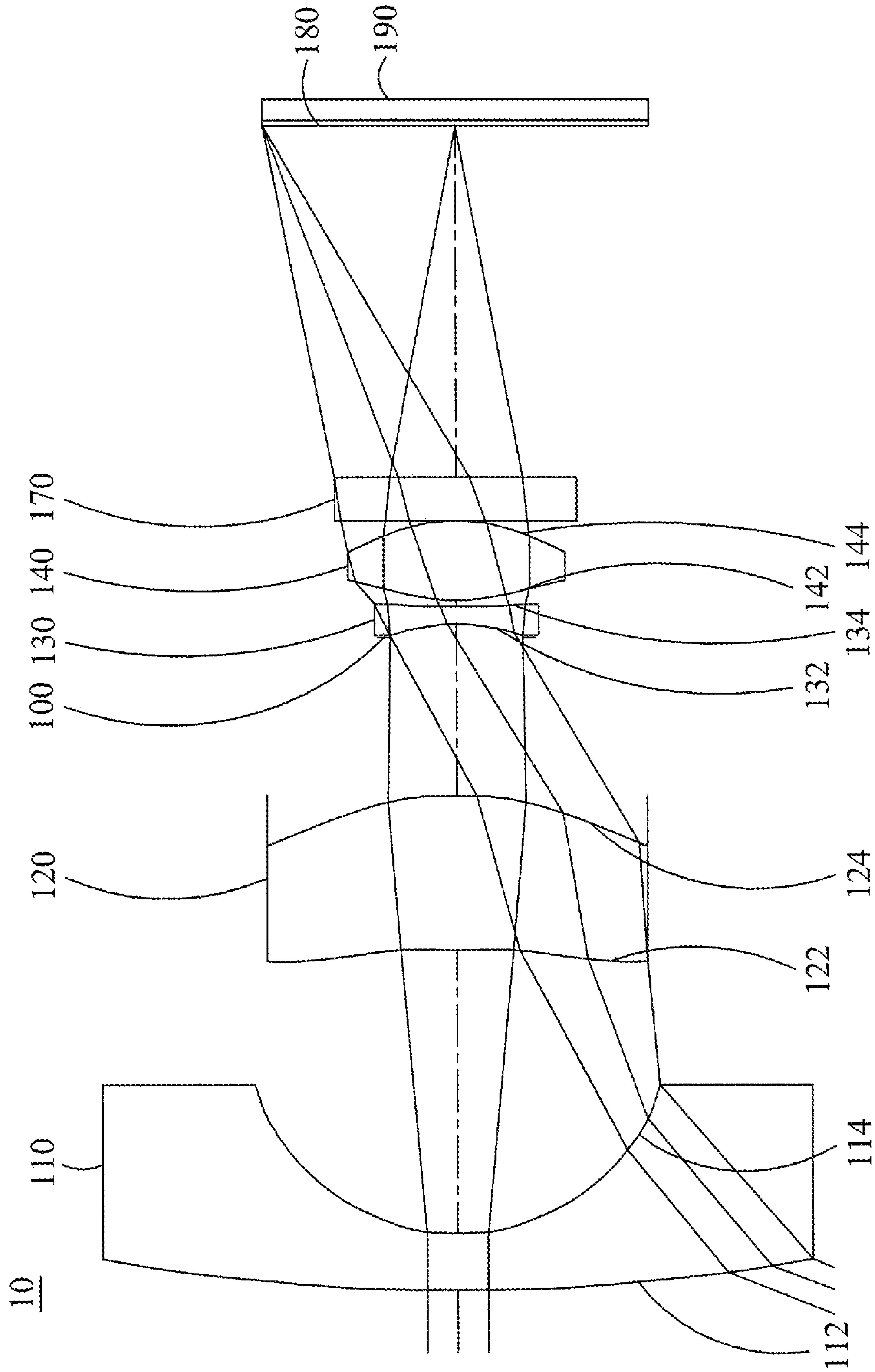

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FIG. 1A

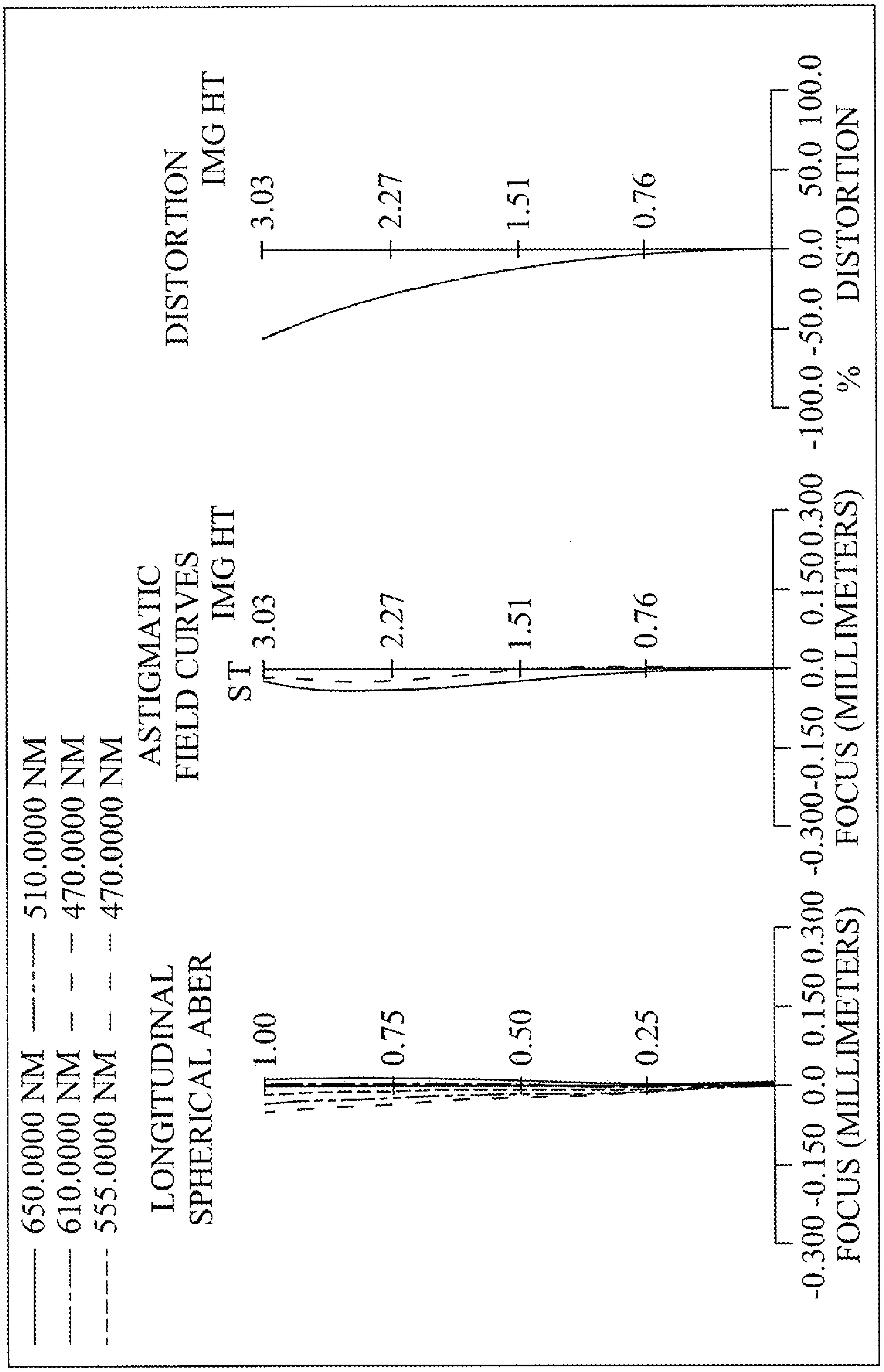
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FIG. 1B

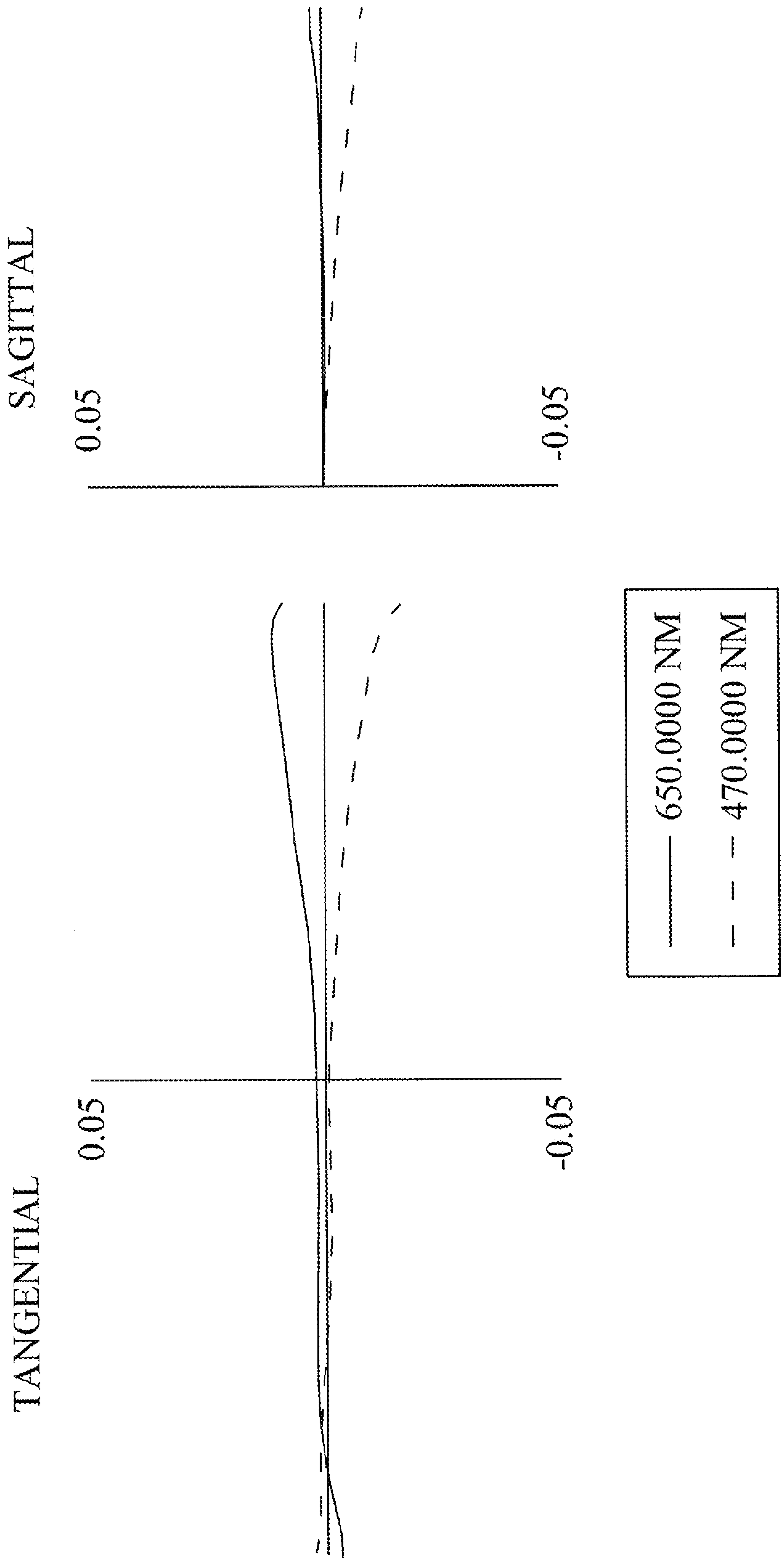
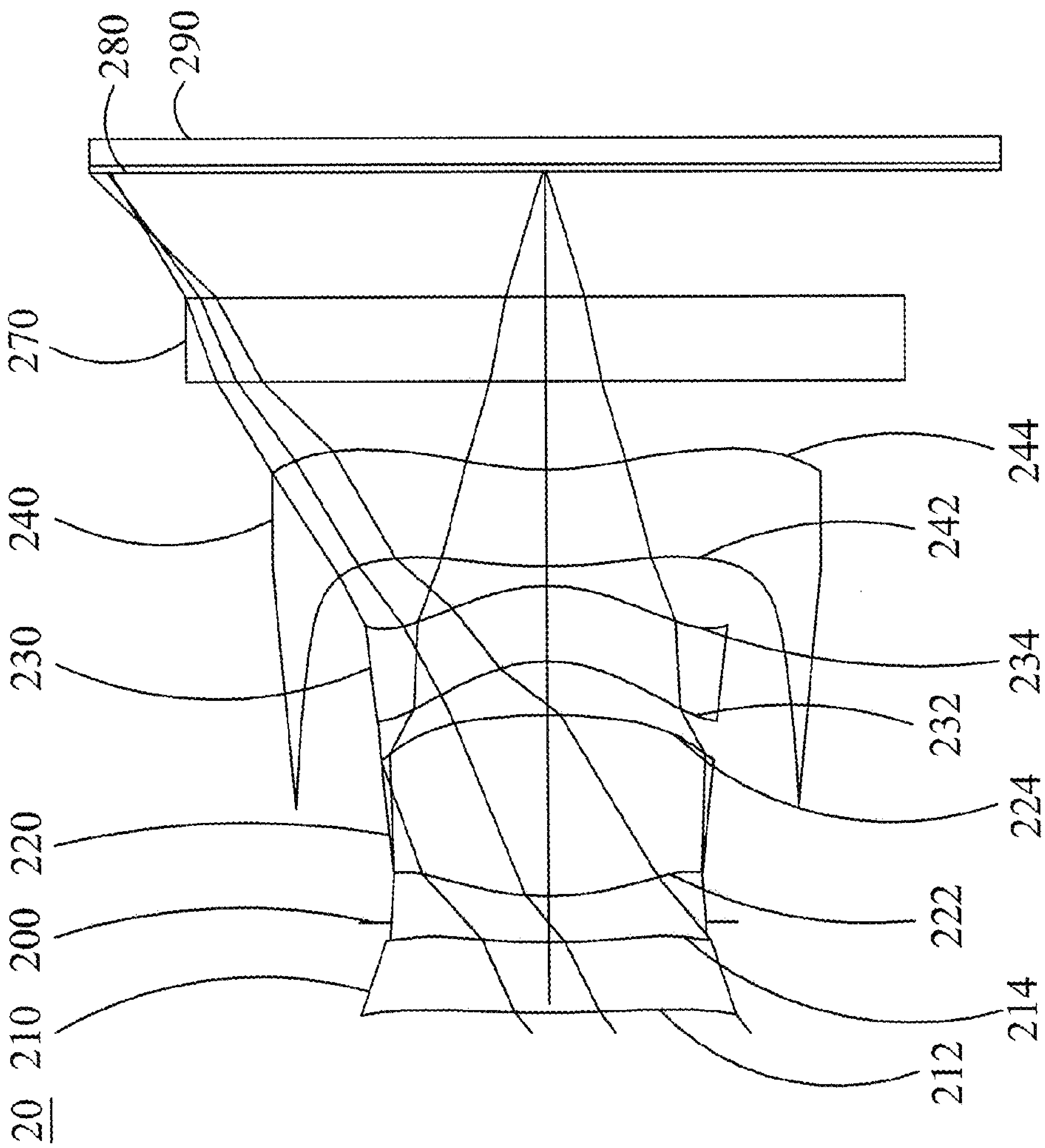


FIG. 1C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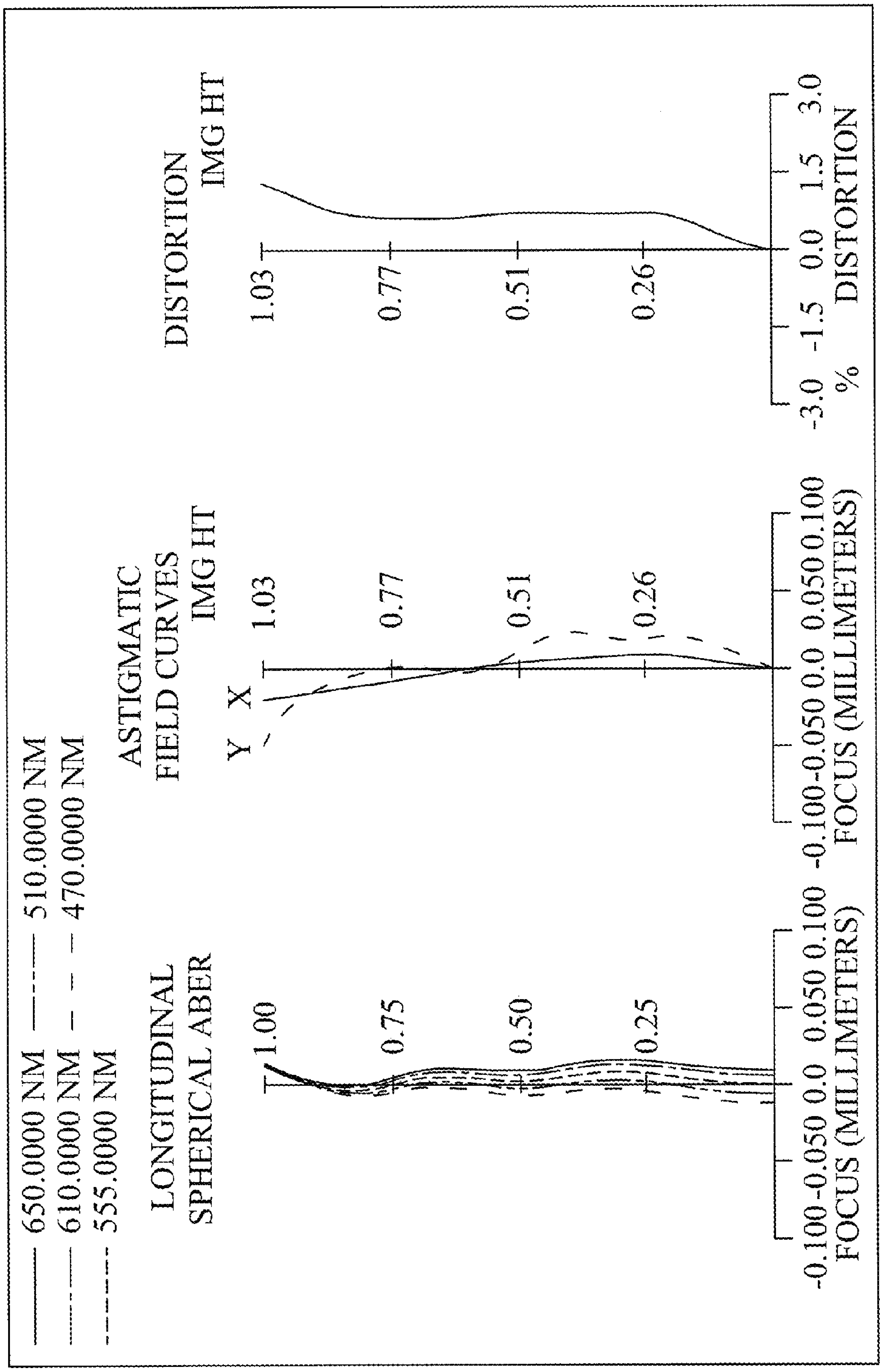
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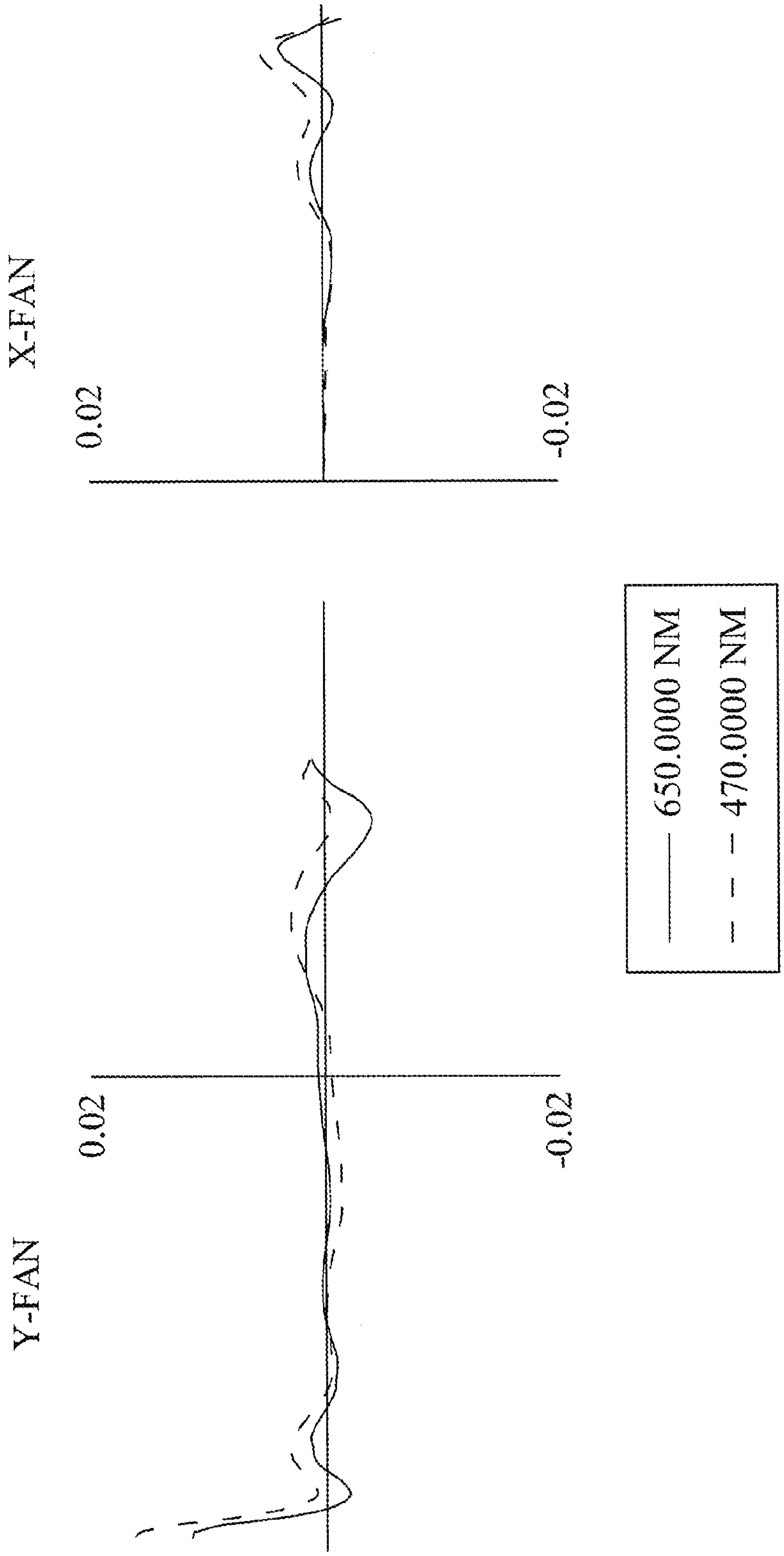
FIG. 2B



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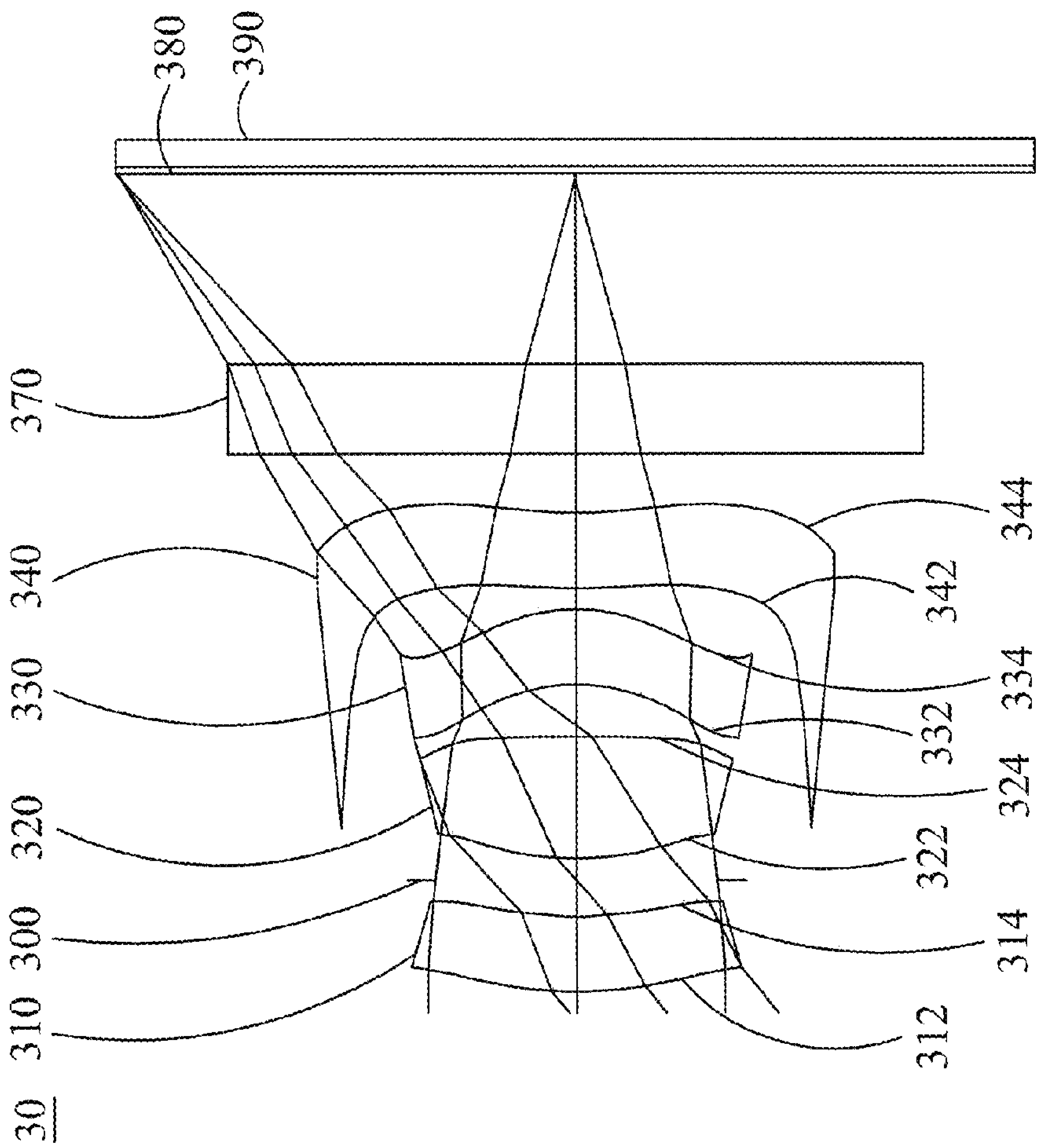
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FIG. 3A

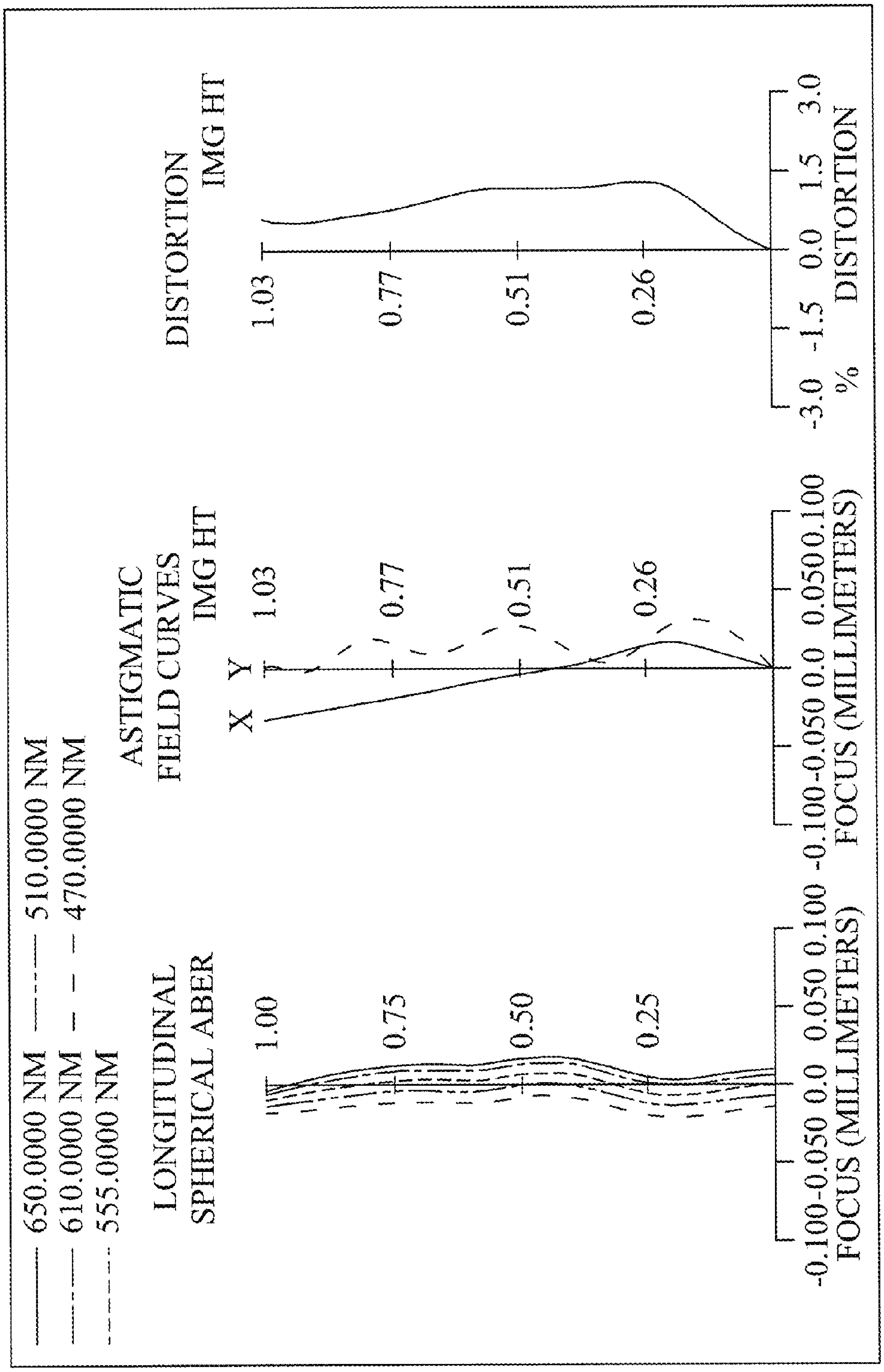
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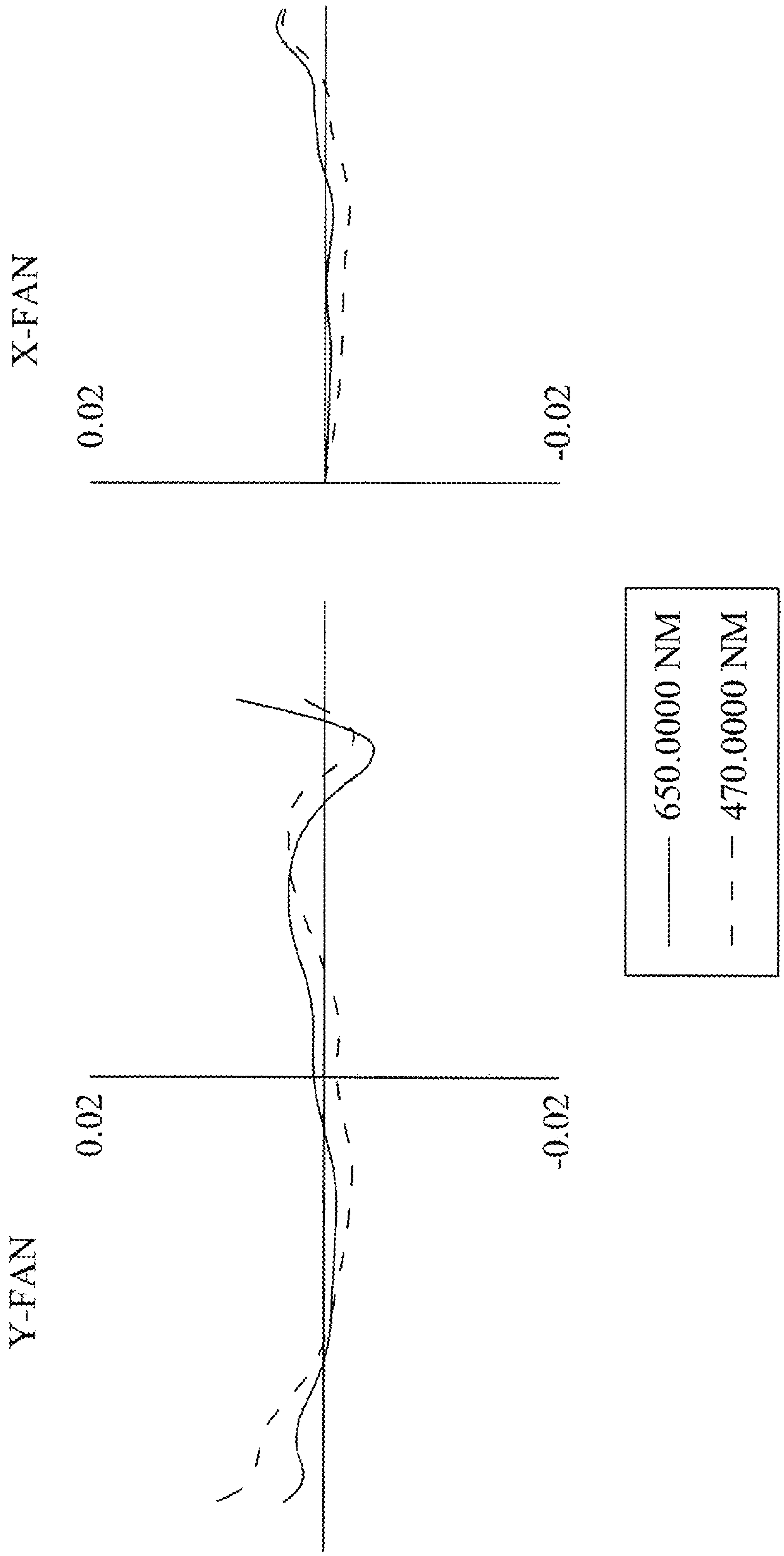
FIG. 3B



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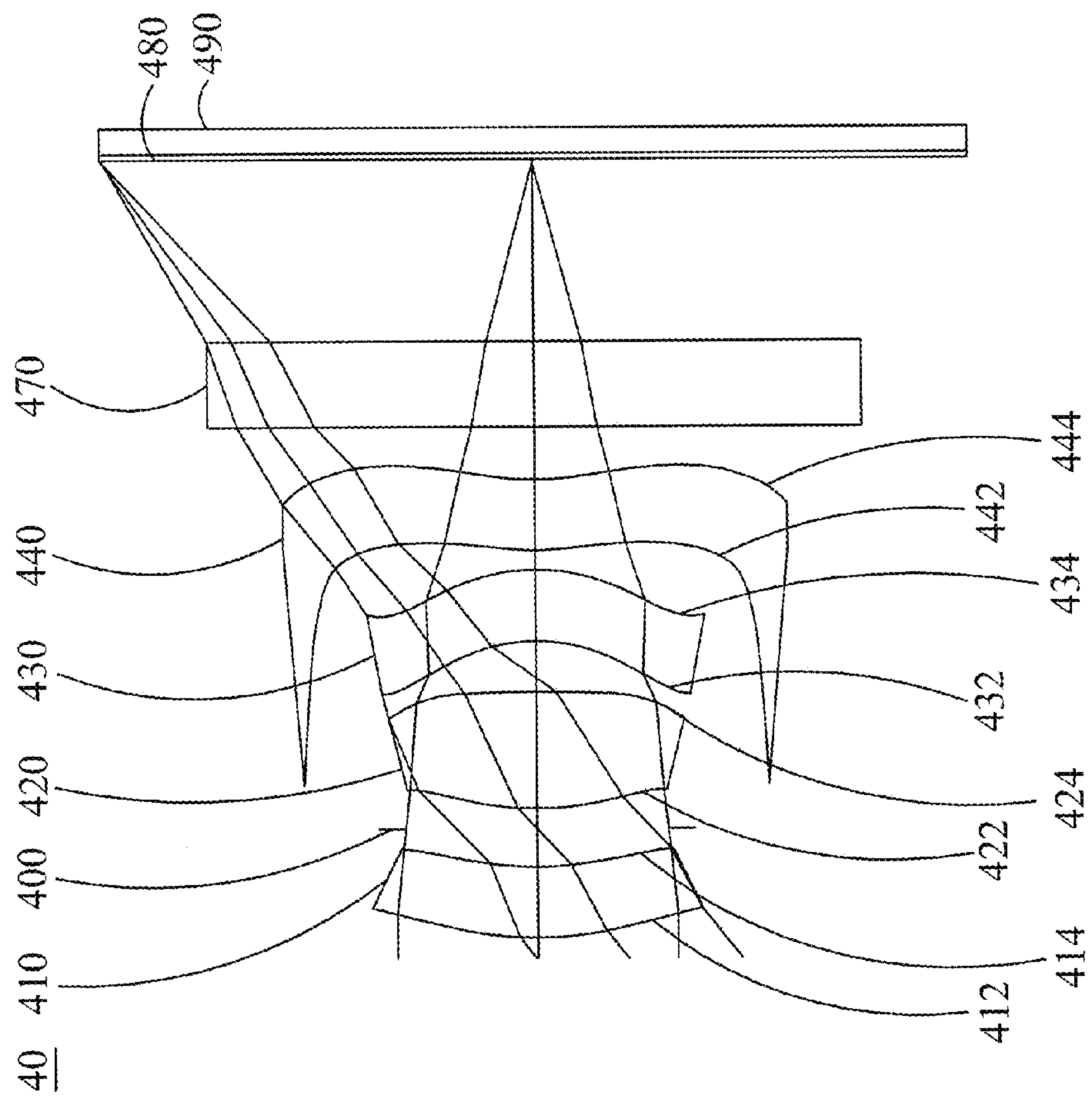
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FIG. 4A

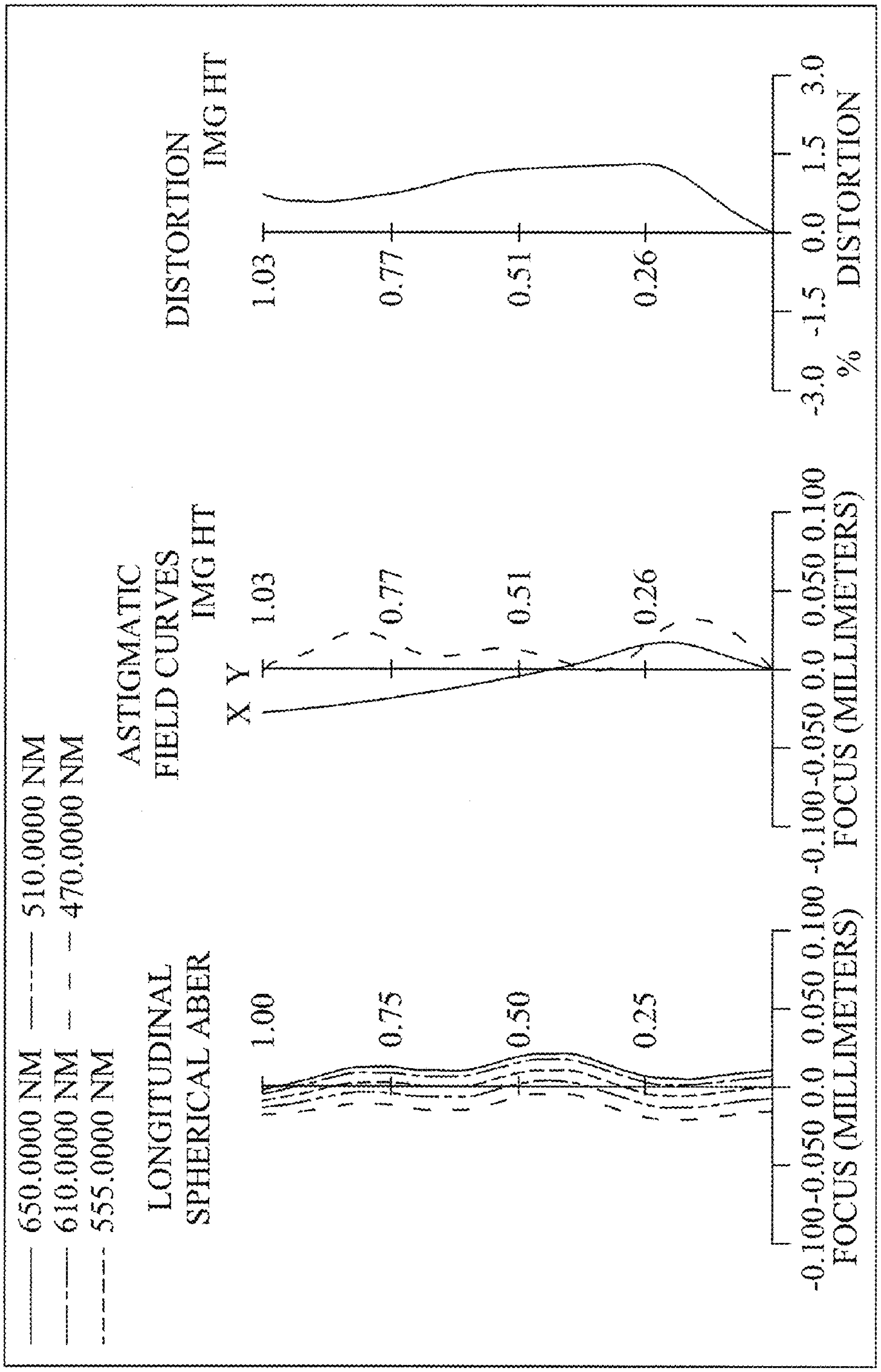
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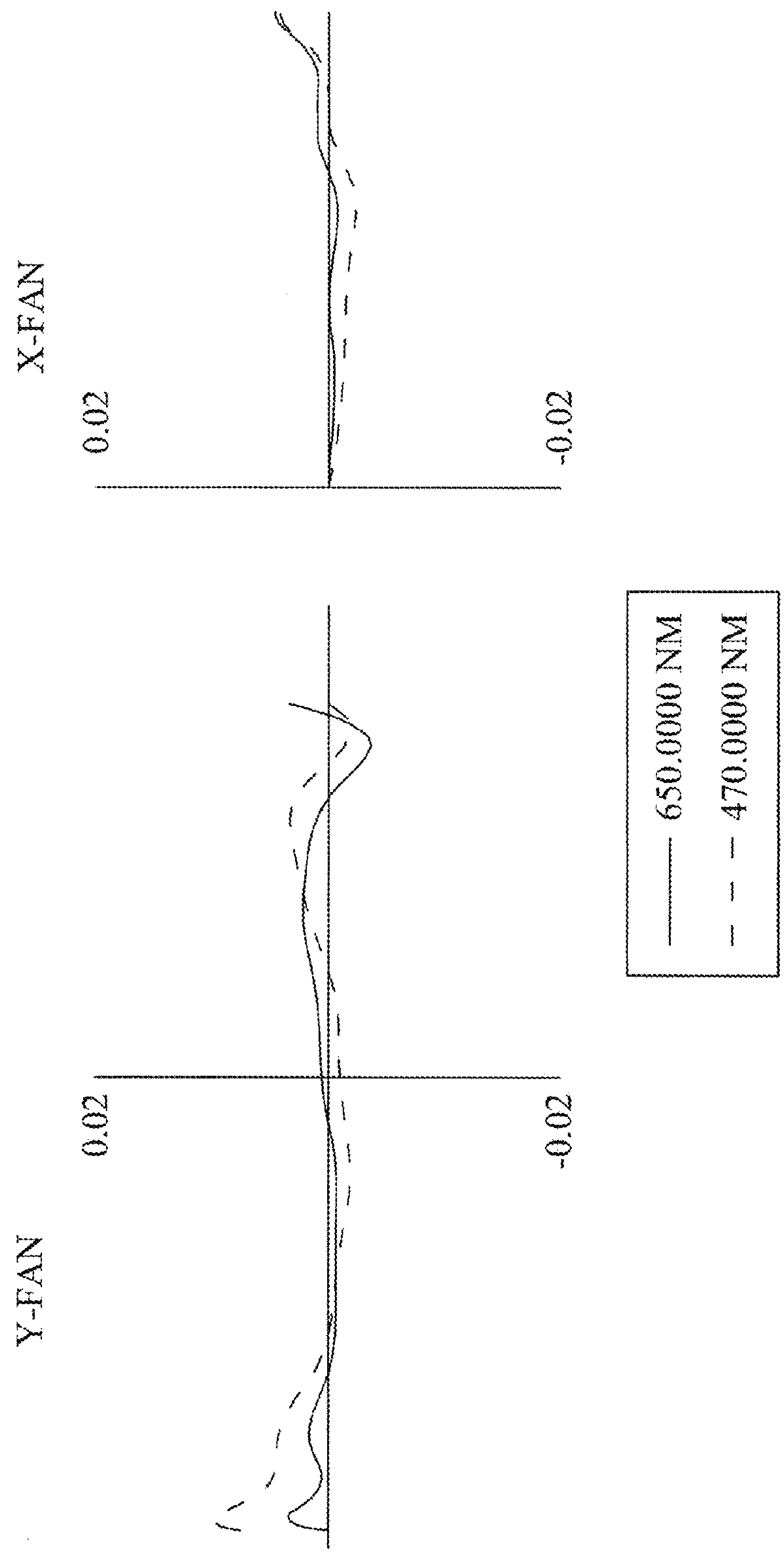
FIG. 4B



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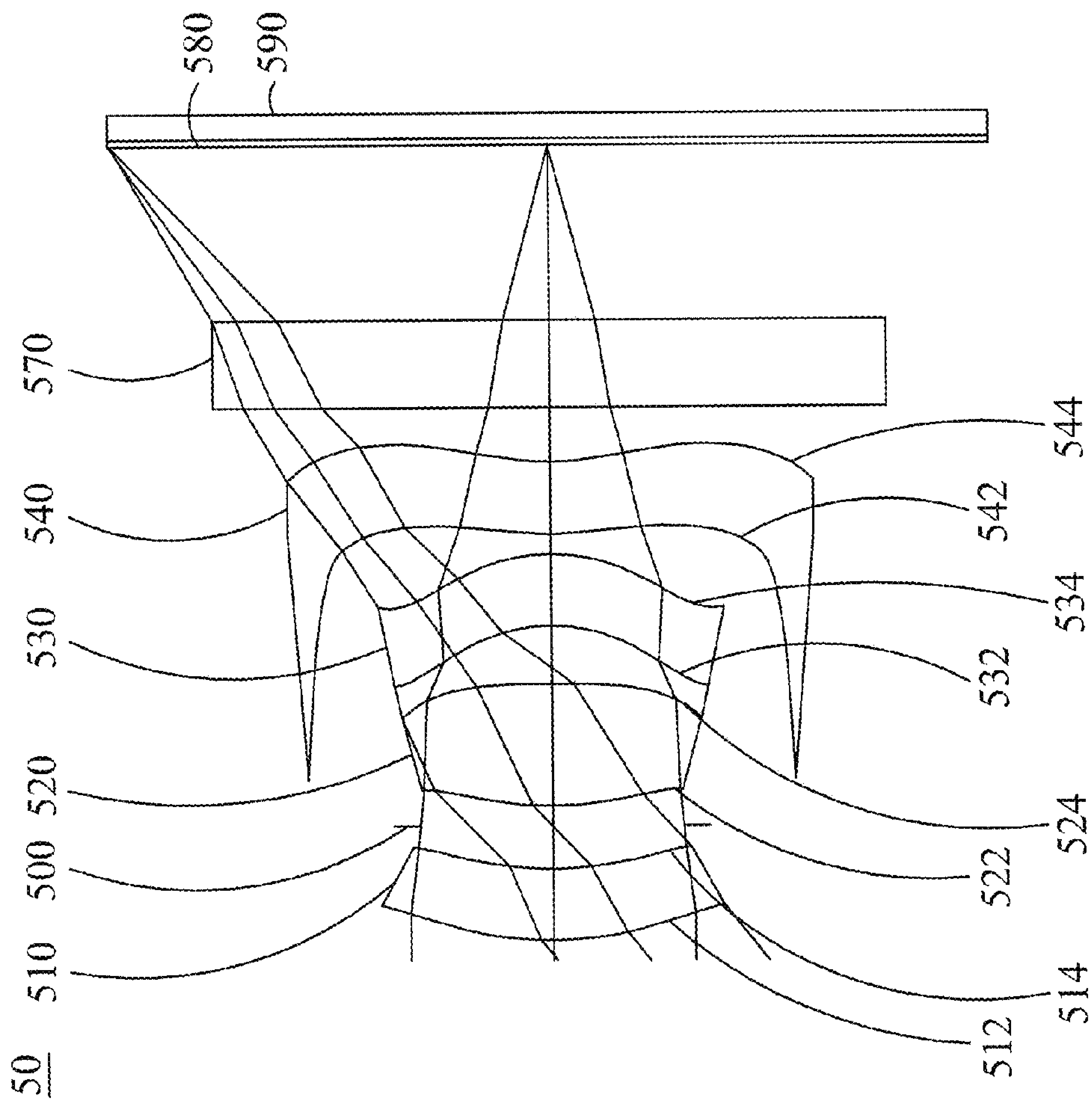
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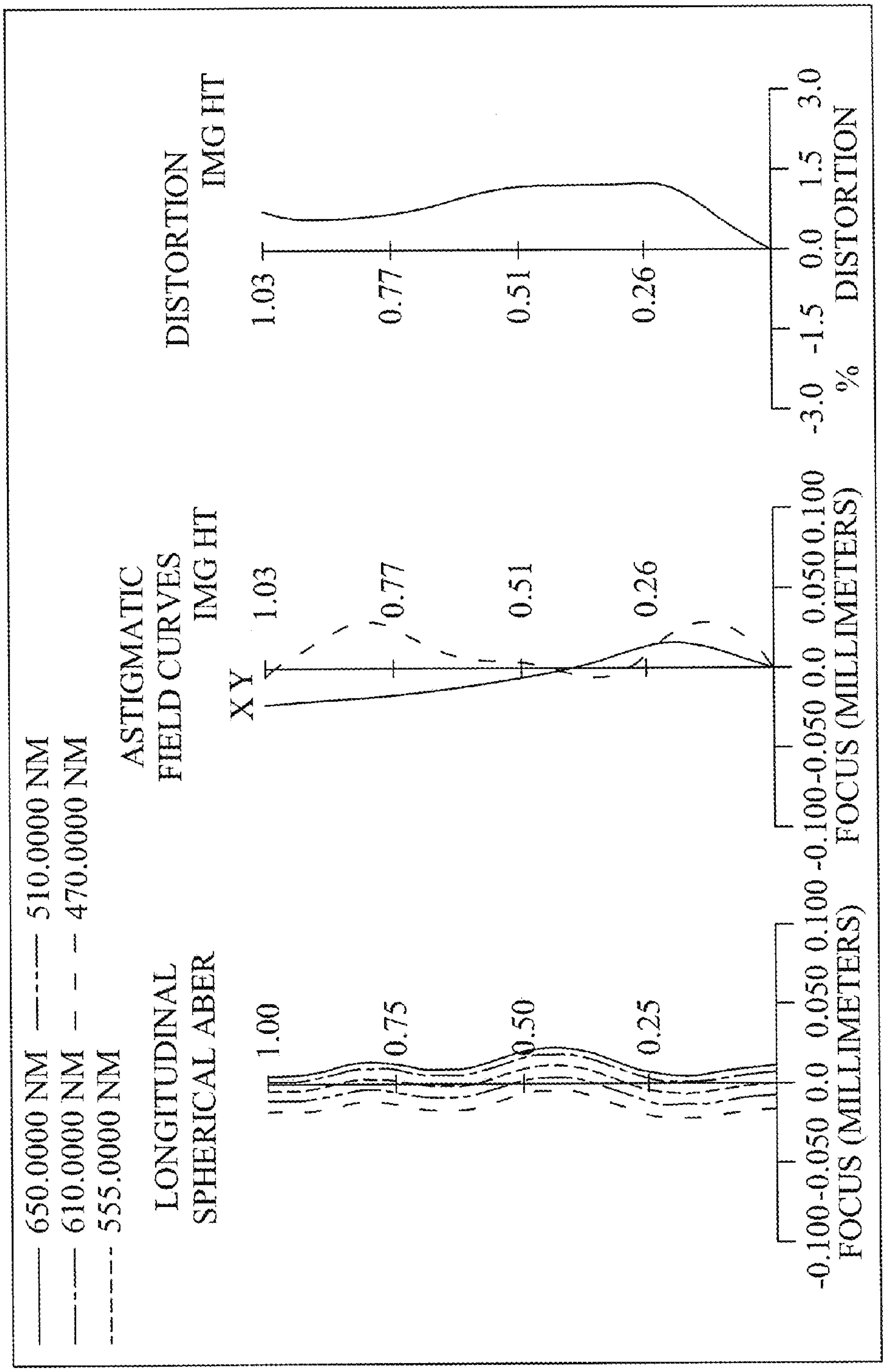
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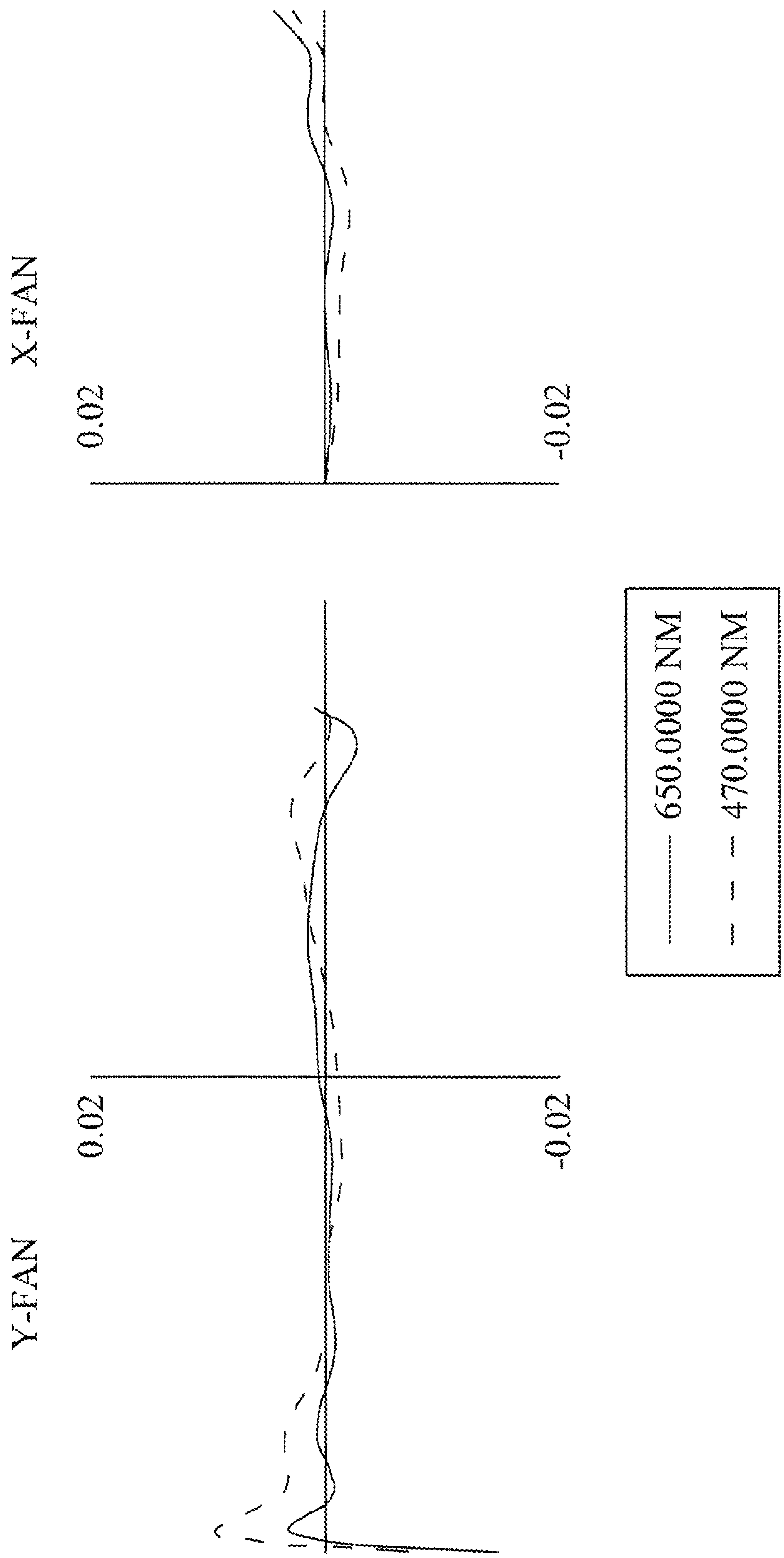
FIG. 5B



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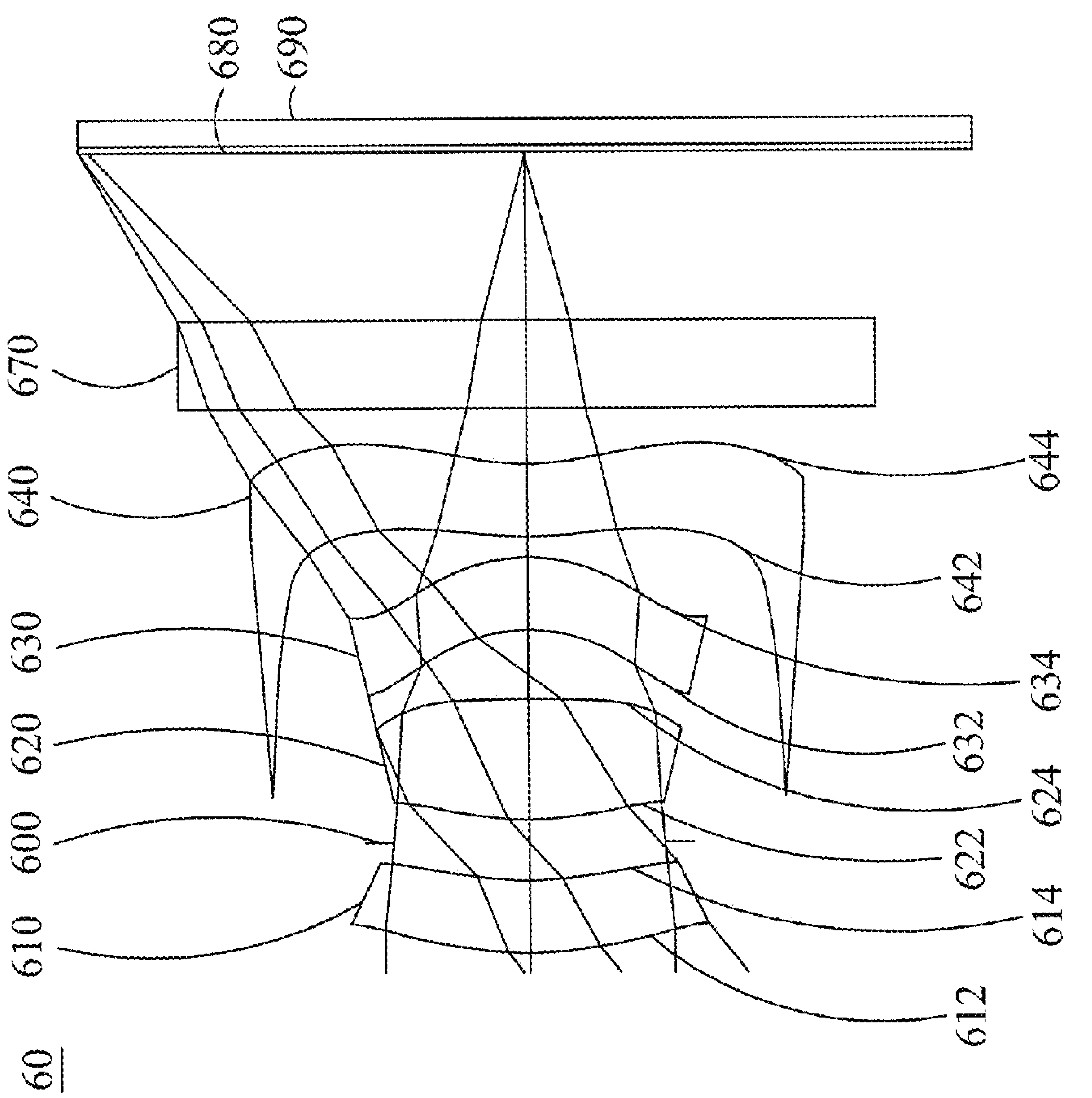
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FIG. 6A

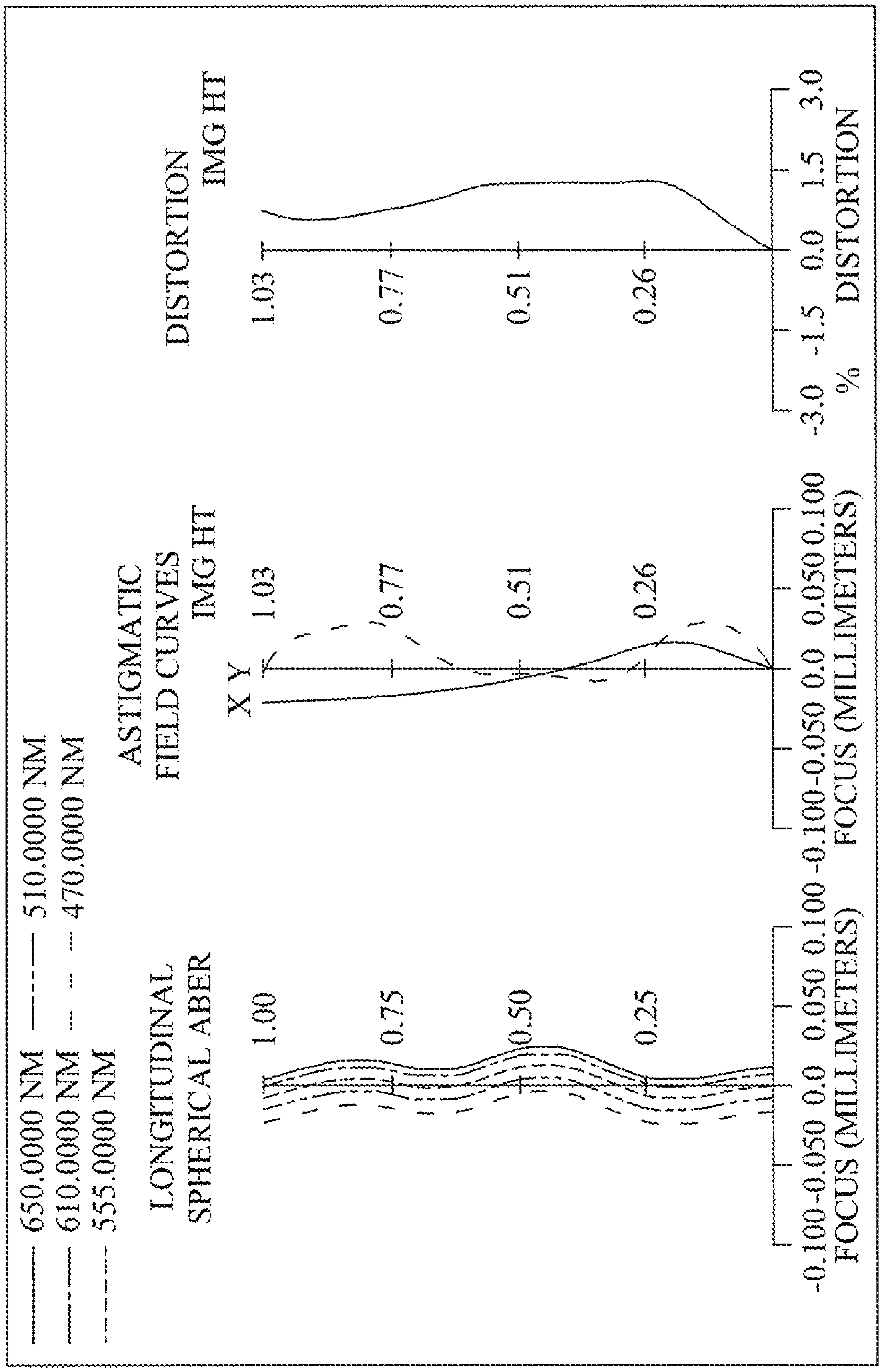
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FIG. 6B

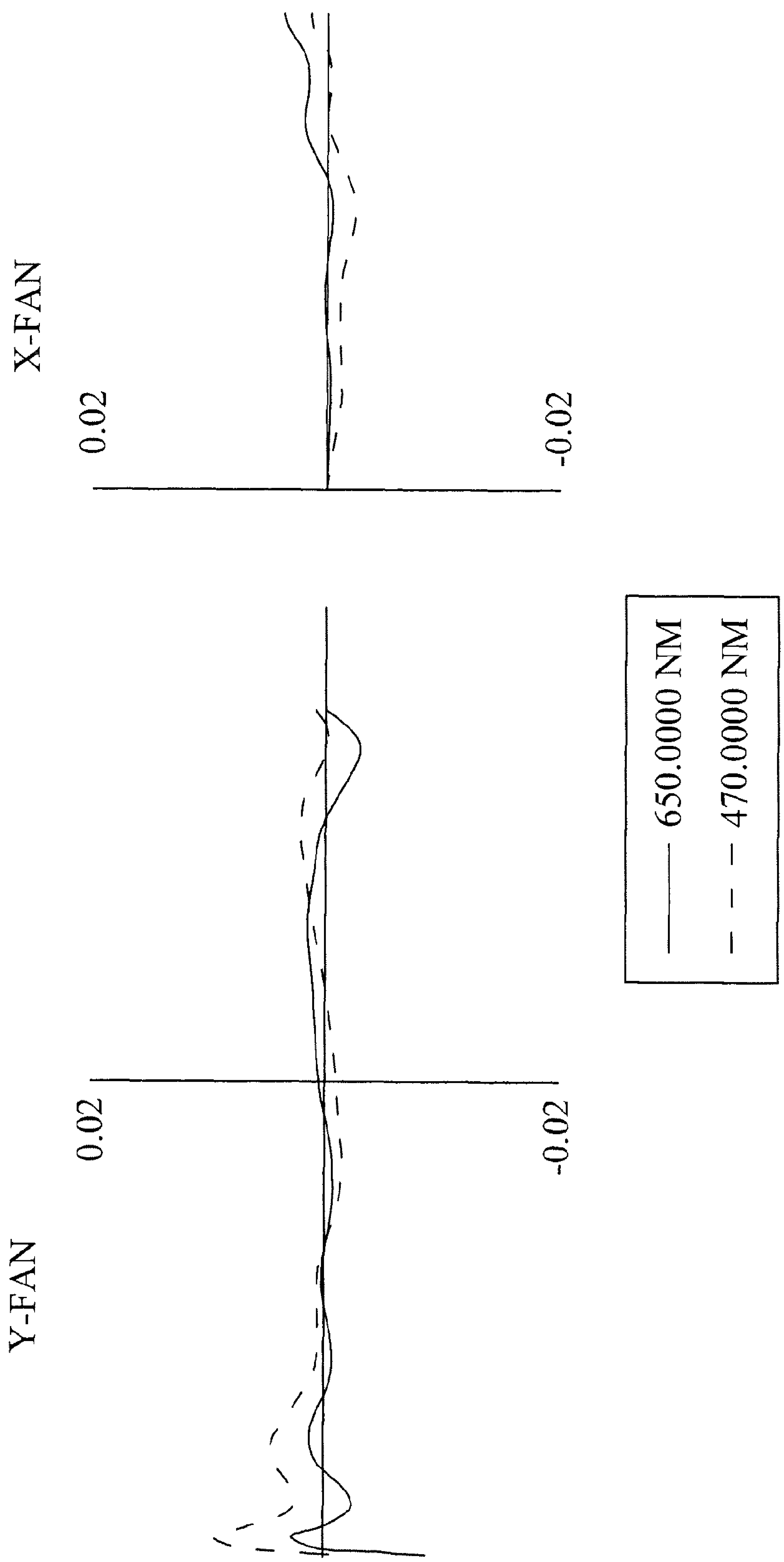
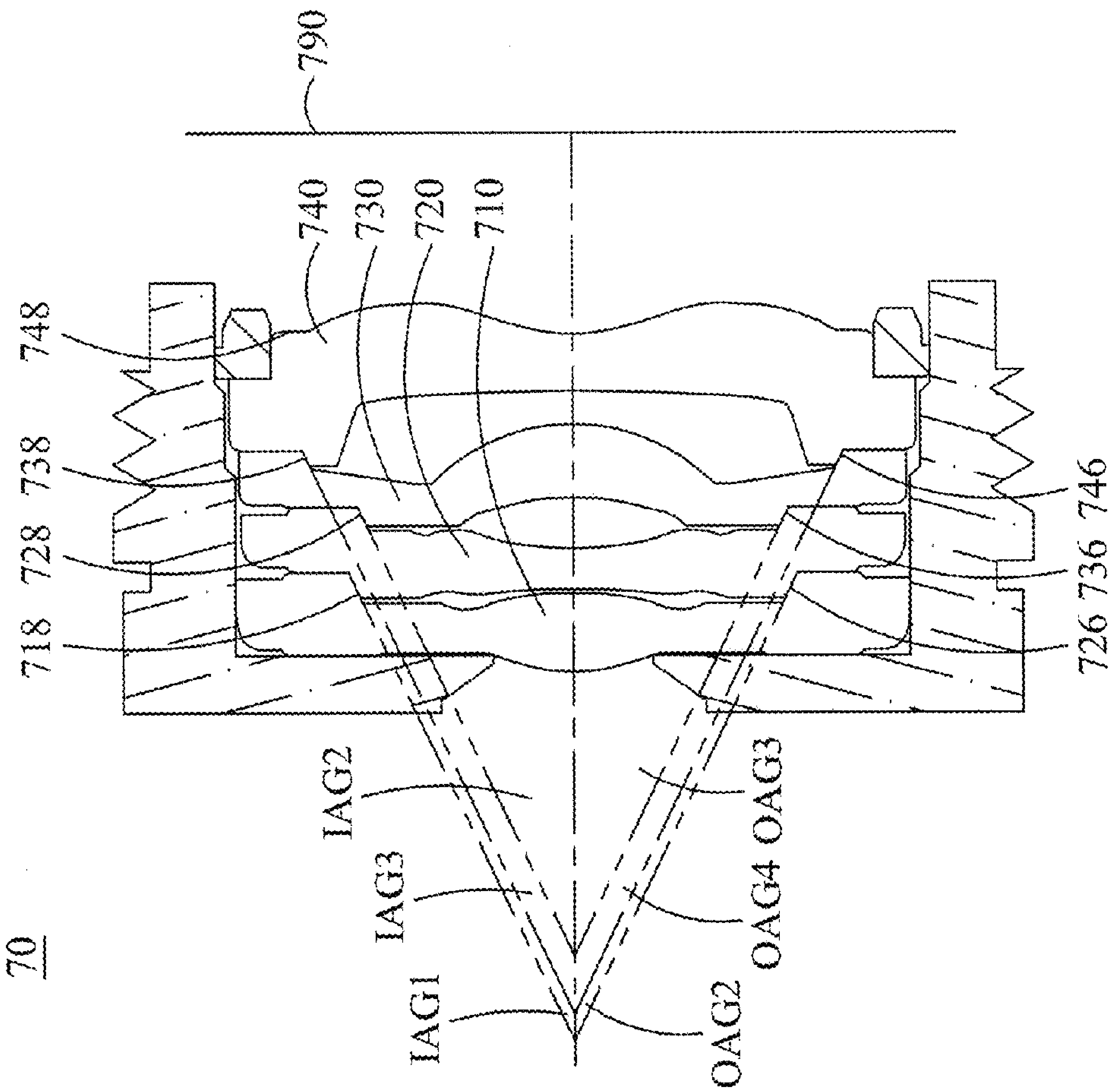


FIG. 6C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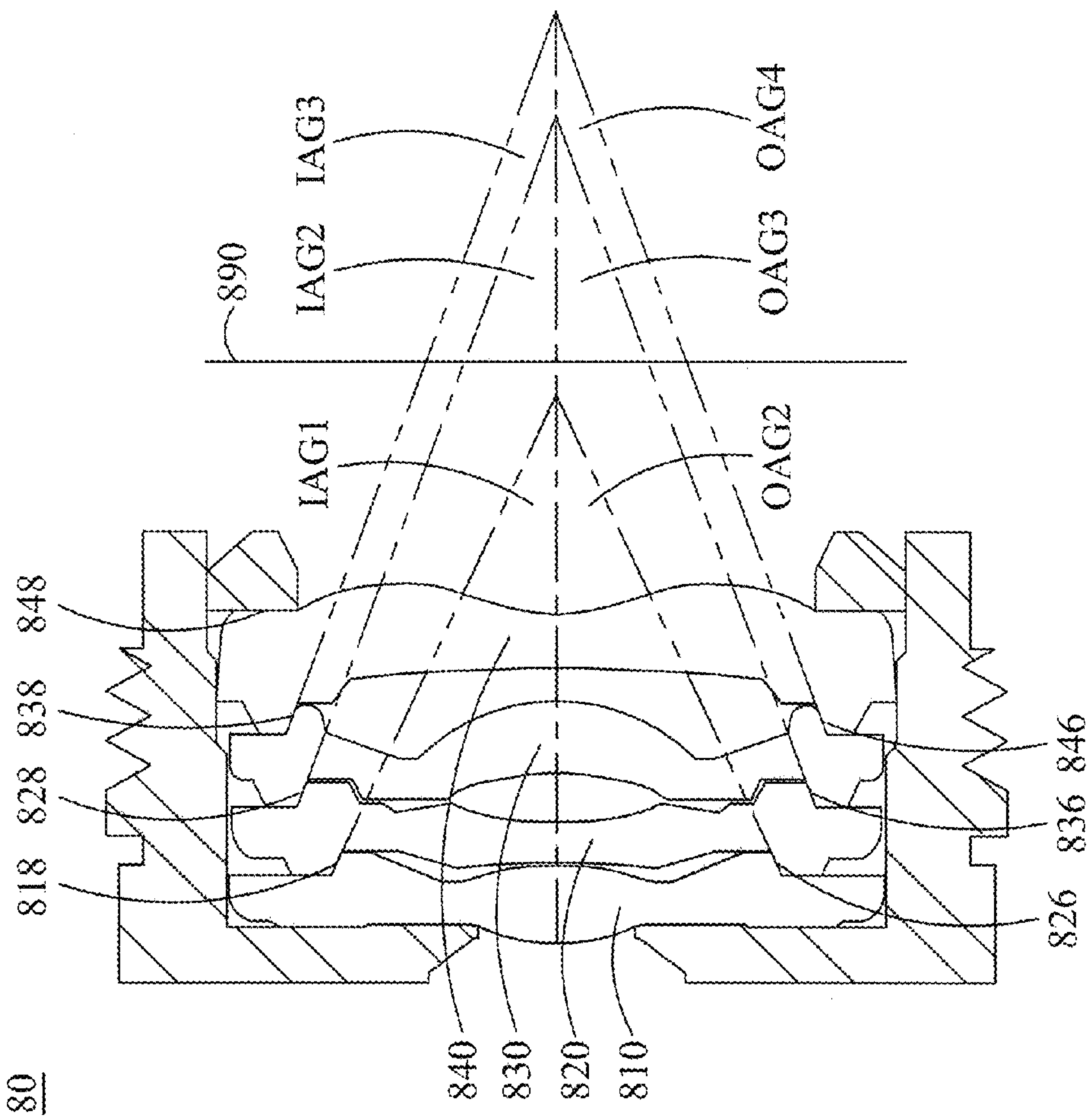
OAG3
OAG4
OAG2

FIG. 7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IAG1
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IAG3
OAG2
OAG3
OAG4
826
836
846

FIG. 8

OPTICAL IMAGE CAPTURING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of Taiwan Patent Application No. 105109252, filed on Mar. 24, 2016, in the Taiwan Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present disclosure relates to an optical image capturing system, and more particularly to a compact optical image capturing system which can be applied to electronic products.

2. Description of the Related Art

In recent years, with the rise of portable electronic devices having camera functionalities, the demand for an optical image capturing system is raised gradually. The image sensing device of ordinary photographing camera is commonly selected from charge coupled device (CCD) or complementary metal-oxide semiconductor sensor (CMOS Sensor). In addition, as advanced semiconductor manufacturing technology enables the minimization of pixel size of the image sensing device, the development of the optical image capturing system directs towards the field of high pixels. Therefore, the requirement for high imaging quality is rapidly raised.

The traditional optical image capturing system of a portable electronic device comes with different designs, including a second-lens or a third-lens design. However, the requirement for the higher pixels and the requirement for a large aperture of an end user, like functionalities of micro filming and night view, or the requirement of wide view angle of the portable electronic device have been raised. But the optical image capturing system with the large aperture design often produces more aberration resulting in the deterioration of quality in peripheral image formation and difficulties of manufacturing, and the optical image capturing system with wide view angle design increases distortion rate in image formation, thus the optical image capturing system in prior arts cannot meet the requirement of the higher order camera lens module.

Therefore, how to effectively increase quantity of incoming light and view angle of the optical lenses, not only further improves total pixels and imaging quality for the image formation, but also considers the equity design of the miniaturized optical lenses, becomes a quite important issue.

SUMMARY OF THE INVENTION

The aspect of embodiment of the present disclosure directs to an optical image capturing system and an optical image capturing lens which use combination of refractive powers, convex and concave surfaces of four-piece optical lenses (the convex or concave surface in the disclosure denotes the geometrical shape of an image-side surface or an object-side surface of each lens on an optical axis) and elements of insertion mechanism for positioning the lens element to increase the amount of light admitted into the optical image capturing system and the view angle of the optical lenses, and to improve total pixels and imaging quality for image formation, so as to be applied to minimized electronic products.

The term and its definition to the lens element parameter in the embodiment of the present invention are shown as below for further reference.

The Lens Element Parameter Related to a Length or a Height in the Lens Element

A height for image formation of the optical image capturing system is denoted by HOI. A height of the optical image capturing system is denoted by HOS. A distance from the object-side surface of the first lens element to the image-side surface of the fourth lens element is denoted by InTL. A distance from the image-side surface of the fourth lens element to an image plane is denoted by InB. InTL+InB=HOS. A distance from an aperture stop (aperture) to an image plane is denoted by InS. A distance from the first lens element to the second lens element is denoted by In**12** (example). A central thickness of the first lens element of the optical image capturing system on the optical axis is denoted by TP**1** (example).

The Lens Element Parameter Related to a Material in the Lens Element

An Abbe number of the first lens element in the optical image capturing system is denoted by NA**1** (example). A refractive index of the first lens element is denoted by Nd**1** (example).

The Lens Element Parameter Related to a View Angle in the Lens Element

A view angle is denoted by AF. Half of the view angle is denoted by HAF. A major light angle is denoted by MRA.

The Lens Element Parameter Related to Exit/Entrance Pupil in the Lens Element

An entrance pupil diameter of the optical image capturing system is denoted by HEP. An optical imaging lens system of the exit pupil of the aperture stop means that after the aperture stop behind the lens group and the image space is formed by the image, the exit pupil diameter is expressed in HXP. An entrance pupil diameter of the optical image capturing system is denoted by HEP. A maximum effective half diameter position of any surface of single lens element means the vertical height between the effective half diameter (EHD) and the optical axis where the incident light of the maximum view angle of the system passes through the farthest edge of the entrance pupil on the EHD of the surface of the lens element. For example, the maximum effective half diameter position of the object-side surface of the first lens element is denoted as EHD**11**. The maximum effective half diameter position of the image-side of the first lens element is denoted as EHD**12**. The maximum effective half diameter position of the object-side surface of the second lens element is denoted as EHD**21**. The maximum half effective half diameter position of the image-side surface of the second lens element is denoted as EHD**22**. The maximum effective half diameter position of any surfaces of the remaining lens elements of the optical image capturing system can be referred as mentioned above.

The Lens Element Parameter Related to Assembly Structures of the Lens Elements

Each object-side surface of each lens element of the optical system may have a bearing surface of object side depending on the requirement, and the image-side surface thereof has a bearing surface of image side. Depending on the requirement, the bearing surface of object side and the bearing surface of image side of each lens element may be respectively configured to be mutually inserted to the adjacent front lens element and the adjacent rear lens element via the contact surfaces thereof, so as to form a stacked structure (the length of the outline of the contact surface in the radial direction of the lens is denoted by BSL). The stacked structure may be designed as a single-insertion structure based on requirement, e.g. the first lens element has a first bearing surface of image side on the image-side surface thereof, and the second lens element has a second bearing surface of object side on the object-side surface thereof, such that the second bearing surface of object side contacts with the first bearing surface of image side and both of them are inserted to each other. Alternatively, the stacked structure may be designed as a double-insertion structure, e.g. a double-insertion structure is provided on the basis of the single-insertion structure. The second lens element has a second bearing surface of image side, the third lens element has a third bearing surface of object side, and the third bearing surface of object side contacts with the second bearing surface of image side such that both of them are inserted to each other.

Alternatively, the structure can be a triple-insertion structure or a full-insertion structure. An optical image capturing system with seven-piece optical lenses, for example, is provided on the basis of double-insertion structure. The third lens element has a third bearing surface of image side on the image-side surface thereof, the fourth lens element has a fourth bearing surface of object side on the object-side surface thereof, and the fourth bearing surface of object side contacts with the third bearing surface of image side such that both of them are inserted to each other. The fourth lens element has a fourth bearing surface of image side on the image-side surface thereof, the fifth lens element has a fifth bearing surface of object side on the object-side surface thereof, and the fifth bearing surface of object side contacts with the fourth bearing surface of image side such that both of them are inserted to each other. The fifth lens element has a fifth bearing surface of image side on the image-side surface thereof, the sixth lens element has a sixth bearing surface of object side on the object-side surface thereof, and the sixth bearing surface of object side contacts with the fifth bearing surface of image side such that both of them are inserted to each other, The sixth lens element has a bearing surface of image side on the image-side surface thereof, the seventh lens element has a seventh bearing surface of object side on the object-side surface thereof, and the seventh bearing surface of object side contacts with the sixth bearing surface of image side such that both of them are inserted to each other.

Take the full-insertion structure of the aforementioned optical image capturing system with seven-piece lenses for example, the extension lines of the first bearing surface of image side to the seventh bearing surface of image side are extending toward the object side or image plane according to requirement and intersect with the optical axis to form angles IAG, which are respectively represented by IAG**1**, IAG**2**, IAG**3**, IAG**4**, IAG**5**, IAG**6**, IAG**7**. The first bearing surface of object side to the seventh bearing surface of image side are extending to object side or image side according to requirement and have a cross angle of OAG with the optical axis, which are respectively represented by OAG**1**, OAG**2**, OAG**3**, OAG**4**, OAG**5**, OAG**6**, and OAG**7**.

The values of the angles IAG and OAG mentioned above should be manipulated manually. Generally, the greater the angles IAG and OAG are, the more the optical image capturing system can be minimized, but it will cause the insertion between one lens element and the other to be less secured. Conversely, if the IAG and OAG have a smaller the angle, the degree of minimization of the optical image capturing system will be smaller, but the insertion between one lens element and another is more secured.

The foregoing stacked structure can effectively prevent the tilting of the assembly of lens elements caused by the lack of precision in the inner wall of the positioning structural element during the assembling of the lens elements in the positioning structural element (e.g. the lens barrel), which will affect the quality of the captured image. Besides, when the optical image capturing system of the present invention is to be minimized, or when the pixels of image sensor in the optical image capturing system are to be minimized, the precision of assembly and bearing between one lens element and another will have high impact on the quality of image formation; whereas the aforementioned stacked structure is able to effectively ensure that the performance of each assembled and borne lens element is close to the designed values.

The Lens Element Parameter Related to an Arc Length of the Lens Element Shape and an Outline of Surface

A length of the maximum effective half diameter outline curve at any surface of a single lens element refers to an arc length of a curve, wherein the curve starts from an axial point on the surface of the lens element, travels along the surface outline of the lens element, and ends at the point which defines the maximum effective half diameter; and this arc length is denoted as ARS. For example, the length of the maximum effective half diameter outline curve of the object-side surface of the first lens element is denoted as ARS**11**. The length of the maximum effective half diameter outline curve of the image-side surface of the first lens element is denoted as ARS**12**. The length of the maximum effective half diameter outline curve of the object-side surface of the second lens element is denoted as ARS**21**. The length of the maximum effective half diameter outline curve of the image-side surface of the second lens element is denoted as ARS**22**. The lengths of the maximum effective half diameter outline curve of any surface of other lens elements in the optical image capturing system are denoted in the similar way.

A length of ½ entrance pupil diameter (HEP) outline curve of any surface of a single lens element refers to an arc length of curve, wherein the curve starts from an axial point on the surface of the lens element, travels along the surface outline of the lens element, and ends at a coordinate point on the surface where the vertical height from the optical axis to the coordinate point is equivalent to ½ entrance pupil diameter; and the arc length is denoted as ARE. For example, the length of the ½ entrance pupil diameter (HEP) outline curve of the object-side surface of the first lens element is denoted as ARE**11**. The length of the ½ entrance pupil diameter (HEP) outline curve of the image-side surface of the first lens element is denoted as ARE**12**. The length of the ½ entrance pupil diameter (HEP) outline curve of the object-side surface of the second lens element is denoted as ARE**21**. The length of the ½ entrance pupil diameter (HEP) outline curve of the image-side surface of the second lens element is denoted as ARE**22**. The lengths of the ½ entrance pupil diameter (HEP) outline curve of any surface of the other lens elements in the optical image capturing system are denoted in the similar way.

The Lens Element Parameter Related to a Depth of the Lens Element Shape

A distance in parallel with an optical axis from a maximum effective diameter position to an axial point on the object-side surface of the fourth lens element is denoted by InRS**41** (example). A distance in parallel with an optical axis from a maximum effective diameter position to an axial point on the image-side surface of the fourth lens element is denoted by InRS**42** (example).

The Lens Element Parameter Related to the Lens Element Shape

A critical point C is a tangent point on a surface of a specific lens element, and the tangent point is tangent to a plane perpendicular to the optical axis and the tangent point cannot be a crossover point on the optical axis. To follow the past, a distance perpendicular to the optical axis between a critical point C**31** on the object-side surface of the third lens element and the optical axis is HVT**31** (example). A distance perpendicular to the optical axis between a critical point C**32** on the image-side surface of the third lens element and the optical axis is HVT**32** (example). A distance perpendicular to the optical axis between a critical point C**41** on the object-side surface of the fourth lens element and the optical axis is HVT**41** (example). A distance perpendicular to the optical axis between a critical point C**42** on the image-side surface of the fourth lens element and the optical axis is HVT**42** (example). Distances perpendicular to the optical axis between critical points on the object-side surfaces or the image-side surfaces of other lens elements and the optical axis are denoted in the similar way described above.

The object-side surface of the fourth lens element has one inflection point IF**411** which is nearest to the optical axis, and the sinkage value of the inflection point IF**411** is denoted by SGI**411** (example). SGI**411** is a horizontal shift distance in parallel with the optical axis from an axial point on the object-side surface of the fourth lens element to the inflection point which is nearest to the optical axis on the object-side surface of the fourth lens element. A distance perpendicular to the optical axis between the inflection point IF**411** and the optical axis is HIF**411** (example). The image-side surface of the fourth lens element has one inflection point IF**421** which is nearest to the optical axis and the sinkage value of the inflection point IF**421** is denoted by SGI**421** (example). SGI**421** is a horizontal shift distance in parallel with the optical axis from an axial point on the image-side surface of the fourth lens element to the inflection point which is nearest to the optical axis on the image-side surface of the fourth lens element. A distance perpendicular to the optical axis between the inflection point IF**421** and the optical axis is HIF**421** (example).

The object-side surface of the fourth lens element has one inflection point IF**412** which is the second nearest to the optical axis and the sinkage value of the inflection point IF**412** is denoted by SGI**412** (example). SGI**412** is a horizontal shift distance in parallel with the optical axis from an axial point on the object-side surface of the fourth lens element to the inflection point which is the second nearest to the optical axis on the object-side surface of the fourth lens element. A distance perpendicular to the optical axis between the inflection point IF**412** and the optical axis is HIF**412** (example). The image-side surface of the fourth lens element has one inflection point IF**422** which is the second nearest to the optical axis and the sinkage value of the inflection point IF**422** is denoted by SGI**422** (example). SGI**422** is a horizontal shift distance in parallel with the optical axis from an axial point on the image-side surface of the fourth lens element to the inflection point which is the second nearest to the optical axis on the image-side surface of the fourth lens element. A distance perpendicular to the optical axis between the inflection point IF**422** and the optical axis is HIF**422** (example).

The object-side surface of the fourth lens element has one inflection point IF**413** which is the third nearest to the optical axis and the sinkage value of the inflection point IF**413** is denoted by SGI**413** (example). SGI**413** is a horizontal shift distance in parallel with the optical axis from an axial point on the object-side surface of the fourth lens element to the inflection point which is the third nearest to the optical axis on the object-side surface of the fourth lens element. A distance perpendicular to the optical axis between the inflection point IF**413** and the optical axis is HIF**413** (example). The image-side surface of the fourth lens element has one inflection point IF**423** which is the third nearest to the optical axis and the sinkage value of the inflection point IF**423** is denoted by SGI**423** (example). SGI**423** is a horizontal shift distance in parallel with the optical axis from an axial point on the image-side surface of the fourth lens element to the inflection point which is the third nearest to the optical axis on the image-side surface of the fourth lens element. A distance perpendicular to the optical axis between the inflection point IF**423** and the optical axis is HIF**423** (example).

The object-side surface of the fourth lens element has one inflection point IF**414** which is the fourth nearest to the optical axis and the sinkage value of the inflection point IF**414** is denoted by SGI**414** (example). SGI**414** is a horizontal shift distance in parallel with the optical axis from an axial point on the object-side surface of the fourth lens element to the inflection point which is the fourth nearest to the optical axis on the object-side surface of the fourth lens element. A distance perpendicular to the optical axis between the inflection point IF**414** and the optical axis is HIF**414** (example). The image-side surface of the fourth lens element has one inflection point IF**424** which is the fourth nearest to the optical axis and the sinkage value of the inflection point IF**424** is denoted by SGI**424** (example). SGI**424** is a horizontal shift distance in parallel with the optical axis from an axial point on the image-side surface of the fourth lens element to the inflection point which is the fourth nearest to the optical axis on the image-side surface of the fourth lens element. A distance perpendicular to the optical axis between the inflection point IF**424** and the optical axis is HIF**424** (example).

The inflection points on the object-side surfaces or the image-side surfaces of the other lens elements and the distances perpendicular to the optical axis thereof or the sinkage values thereof are denoted in the similar way described above.

The Lens Element Parameter Related to an Aberration

Optical distortion for image formation in the optical image capturing system is denoted by ODT. TV distortion for image formation in the optical image capturing system is denoted by TDT. Further, the range of the aberration offset for the view of image formation may be limited to 50%-100%. An offset of the spherical aberration is denoted by DFS. An offset of the coma aberration is denoted by DFC.

The lateral aberration of the stop is denoted as STA to assess the function of the specific optical image capturing system. The tangential fan or sagittal fan may be applied to calculate the STA of any view fields, and in particular, to calculate the STA of the max reference wavelength (e.g. 650 nm) and the minima reference wavelength (e.g. 470 nm) for serve as the standard of the optimal function. The aforementioned direction of the tangential fan can be further defined as the positive (overhead-light) and negative (lower-light) directions. The max operation wavelength, which passes through the STA, is defined as the image position of the specific view field, and the distance difference of two positions of image position of the view field between the max operation wavelength and the reference primary wavelength (e.g. wavelength of 555 nm), and the minimum operation wavelength, which passes through the STA, is defined as the image position of the specific view field, and STA of the max operation wavelength is defined as the distance between the image position of the specific view field of max operation wavelength and the image position of the specific view field of the reference primary wavelength (e.g. wavelength of 555 nm), and STA of the minimum operation wavelength is defined as the distance between the image position of the specific view field of the minimum operation wavelength and the image position of the specific view field of the reference primary wavelength (e.g. wavelength of 555 nm) are assessed the function of the specific optical image capturing system to be optimal. Both STA of the max operation wavelength and STA of the minimum operation wavelength on the image position of vertical height with a distance from the optical axis to 70% HOI (i.e. 0.7 HOI), which are smaller than 50 μm, are served as the sample. The numerical, which are smaller than 30 μm, are also served as the sample.

A maximum height for image formation on the image plane perpendicular to the optical axis in the optical image capturing system is denoted by HOI. A lateral aberration of the longest operation wavelength of a visible light of a positive direction tangential fan of the optical image capturing system passing through an edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as PLTA. A lateral aberration of the shortest operation wavelength of a visible light of the positive direction tangential fan of the optical image capturing system passing through the edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as PSTA. A lateral aberration of the longest operation wavelength of a visible light of a negative direction tangential fan of the optical image capturing system passing through the edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as NLTA. A lateral aberration of the shortest operation wavelength of a visible light of a negative direction tangential fan of the optical image capturing system passing through the edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as NSTA. A lateral aberration of the longest operation wavelength of a visible light of a sagittal fan of the optical image capturing system passing through the edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as SLTA. A lateral aberration of the shortest operation wavelength of a visible light of the sagittal fan of the optical image capturing system passing through the edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as SSTA.

The disclosure provides an optical image capturing system, an object-side surface or an image-side surface of the fourth lens element may have inflection points, such that the angle of incidence from each view field to the fourth lens element can be adjusted effectively and the optical distortion and the TV distortion can be corrected as well. Besides, the surfaces of the fourth lens element may have a better optical path adjusting ability to acquire better imaging quality.

The disclosure provides an optical image capturing system, in the order from an object side to an image side, including a first, second, third, and fourth lens elements and an image plane. The first lens element has refractive power and a first bearing surface of image side on the image-side surface thereof. The second lens element has refractive power; and the second lens element has a second bearing surface of object side on the object-side surface and a second bearing surface of image side on the image-side surface thereof. The second bearing surface of object side and the first bearing surface of image side contact with each other. The third lens element has refractive power and the fourth lens element has refractive power. At least one lens element among the four lens elements has positive refractive power. Focal lengths of the first through fourth lens elements are f**1**, f**2**, f**3**, and f**4** respectively. A focal length of the optical image capturing system is f. An entrance pupil diameter of the optical image capturing system is HEP. A distance on an optical axis from an object-side surface of the first lens element to the image plane is HOS. A distance on the optical axis from the object-side surface of the first lens element to the image-side surface of the fourth lens element is InTL. A half of a maximum view angle of the optical image capturing system is HAF. A length of outline curve from an axial point on any surface of any one of the six lens elements to a coordinate point of vertical height with a distance of a half of the entrance pupil diameter from the optical axis on the surface along an outline of the surface is denoted as ARE. The following conditions are satisfied: $1.0 \leq f/HEP \leq 10.0$, 0 deg<HAF≤150 deg and $0.9 \leq 2(ARE/HEP) \leq 2.0$.

The disclosure provides another optical image capturing system, in the order from an object side to an image side, including a first, second, third, and fourth lens elements and an image plane. The first lens element has refractive power and a first bearing surface of image side on the image-side surface thereof. The second lens element has refractive power; and the second lens element has a second bearing surface of object side on the object-side surface and a second bearing surface of image side on the image-side surface thereof. The second bearing surface of object side and the first bearing surface of image side contact with each other. The third lens has a refractive power, a third bearing surface of object side on the object-side surface thereof and a third bearing surface of image side on the image-side surface thereof. The third bearing surface of object side and the second bearing surface of image side contact with each other. The fourth lens element has refractive power. Both of the extension lines of the first bearing surface of image side to the second bearing surface of image side may intersect with the optical axis to form angles IAG, which are IAG**1** and IAG**2** respectively. The extension lines of the second bearing surface of object side to the third bearing surface of object side may intersect with the optical axis to form angles OAG, namely OAG**2** and OAG**3**. At least one lens element among the first through fourth lens elements has positive refractive power. Focal lengths of the first through fourth lens elements are f**1**, f**2**, f**3**, and f**4**, respectively. A focal length of the optical image capturing system is f. An entrance pupil diameter of the optical image capturing system is HEP. A distance on an optical axis from an object-side surface of the first lens element to the image plane is HOS. A distance on the optical axis from the object-side surface of the first lens element to the image-side surface of the fourth lens element is InTL A half of a maximum view angle of the optical image capturing system is HAF. A length of outline curve from an axial point on any surface of any one of the four lens elements to a coordinate point of vertical height with a distance of a half of the entrance pupil diameter from the optical axis on the surface along an outline of the surface is denoted as ARE. The following conditions are satisfied: 0 deg<IAG≤90 deg; 0 deg<OAG≤90 deg; $1.0 \leq f/HEP \leq 10.0$; 0 deg<HAF≤150 deg and $0.9 \leq 2(ARE/HEP) \leq 2.0$.

The disclosure provides another optical image capturing system, in the order from an object side to an image side, including a first, second, third, and fourth lens elements and an image plane. The first lens element has refractive power and a first bearing surface of image side on the image-side surface thereof. The second lens element has refractive power; and the second lens element has a second bearing surface of object side on the object-side surface and a second bearing surface of image side on the image-side surface thereof. The second bearing surface of object side and the first bearing surface of image side contact with each other. The third lens has refractive power, a third bearing surface of object side on the object-side surface thereof and a third bearing surface of image side on the image-side surface thereof. The third bearing surface of object side and the second bearing surface of image side contact with each other. The fourth lens element has refractive power, a fourth bearing surface of object side on the object-side surface thereof and a fourth bearing surface of image side on the image-side surface thereof. All of the extension lines of the first bearing surface of image side to the third bearing surface of image side may intersect with the optical axis to form angles IAG, namely IAG**1**, IAG**2** and IAG**3**. The extension lines of the second bearing surface of object side to the fourth bearing surface of object side may intersect with the optical axis to form angles OAG, which are OAG**2**, OAG**3** and OAG**4** respectively. At least one lens element among the first through the fourth lens elements has positive refractive power. Focal lengths of the first through fourth lens elements are f**1**, f**2**, f**3**, and f**4** respectively. A focal length of the optical image capturing system is f. An entrance pupil diameter of the optical image capturing system is HEP. A distance on an optical axis from an object-side surface of the first lens element to the image plane is HOS. A distance on the optical axis from the object-side surface of the first lens element to the image-side surface of the fourth lens element is InTL A half of a maximum view angle of the optical image capturing system is HAF. A length of outline curve from an axial point on any surface of any one of the four lens elements to a coordinate point of vertical height with a distance of a half of the entrance pupil diameter from the optical axis on the surface along an outline of the surface is denoted as ARE. The following conditions are satisfied: $0\ \text{deg}<IAG\leq 45\ \text{deg}$; $0\ \text{deg}<OAG\leq 45\ \text{deg}$; $1.0\leq f/HEP\leq 10.0$; $0\ \text{deg}<HAF\leq 150\ \text{deg}$ and $0.9\leq 2(ARE/HEP)\leq 2.0$.

The length of the outline curve of any surface of a signal lens element in the maximum effective half diameter position affects the functions of the surface aberration correction and the optical path difference in each view field. The longer outline curve may lead to a better function of aberration correction, but the difficulty of the production may become inevitable. Hence, the length of the outline curve of the maximum effective half diameter position of any surface of a signal lens element (ARS) has to be controlled, and especially, the ratio relations (ARS/TP) between the length of the outline curve of the maximum effective half diameter position of the surface (ARS) and the thickness of the lens element to which the surface belongs on the optical axis (TP) has to be controlled. For example, the length of the outline curve of the maximum effective half diameter position of the object-side surface of the first lens element is denoted as ARS**11**, and the thickness of the first lens element on the optical axis is TP**1**, and the ratio between both of them is ARS**11**/TP**1**. The length of the outline curve of the maximum effective half diameter position of the image-side surface of the first lens element is denoted as ARS**12**, and the ratio between ARS**12** and TP**1** is ARS**12**/TP**1**. The length of the outline curve of the maximum effective half diameter position of the object-side surface of the second lens element is denoted as ARS**21**, and the thickness of the second lens element on the optical axis is TP**2**, and the ratio between both of them is ARS**21**/TP**2**. The length of the outline curve of the maximum effective half diameter position of the image-side surface of the second lens element is denoted as ARS**22**, and the ratio between ARS**22** and TP**2** is ARS**22**/TP**2**. The ratio relations between the lengths of the outline curve of the maximum effective half diameter position of any surface of the other lens elements and the thicknesses of the lens elements to which the surfaces belong on the optical axis (TP) are denoted in the similar way.

The length of outline curve of half of an entrance pupil diameter of any surface of a single lens element especially affects the functions of the surface aberration correction and the optical path difference in each shared view field. The longer outline curve may lead to a better function of aberration correction, but the difficulty of the production may become inevitable. Hence, the length of outline curve of half of an entrance pupil diameter of any surface of a single lens element has to be controlled, and especially, the ratio relationship between the length of outline curve of half of an entrance pupil diameter of any surface of a single lens element and the thickness on the optical axis has to be controlled. For example, the length of outline curve of the half of the entrance pupil diameter of the object-side surface of the first lens element is denoted as ARE**11**, and the thickness of the first lens element on the optical axis is TP**1**, and the ratio thereof is ARE**11**/TP**1**. The length of outline curve of the half of the entrance pupil diameter of the image-side surface of the first lens element is denoted as ARE**12**, and the thickness of the first lens element on the optical axis is TP**1**, and the ratio thereof is ARE**12**/TP**1**. The length of outline curve of the half of the entrance pupil diameter of the object-side surface of the first lens element is denoted as ARE**21**, and the thickness of the second lens element on the optical axis is TP**2**, and the ratio thereof is ARE**21**/TP**2**. The length of outline curve of the half of the entrance pupil diameter of the image-side surface of the second lens element is denoted as ARE**22**, and the thickness of the second lens element on the optical axis is TP**2**, and the ratio thereof is ARE**22**/TP**2**. The ratio relationship of the remaining lens elements of the optical image capturing system can be referred as mentioned above.

The optical image capturing system described above may be configured to form the image on the image sensing device which is shorter than 1/1.2 inch in diagonal length. The pixel size of the image sensing device is smaller than 1.4 micrometers (μm). Preferably the pixel size thereof is smaller than 1.12 micrometers (μm). The best pixel size thereof is smaller than 0.9 micrometers (μm). Furthermore, the optical image capturing system is applicable to the image sensing device with aspect ratio of 16:9.

The optical image capturing system described above is applicable to the demand of video recording with above millions or ten millions-pixels (e.g. 4K2K or the so-called UHD and QHD) and leads to a good imaging quality.

The height of optical system (HOS) may be reduced to achieve the minimization of the optical image capturing system when the absolute value of f**1** is larger than f**6** ($|f1|>f4$).

When $|f2|+|f3|>|f1|+|f4|$ are satisfied with above relations, at least one of the second through third lens elements may have weak positive refractive power or weak negative refractive power. The weak refractive power indicates that an absolute value of the focal length of a specific lens element is greater than 10. When at least one of the second through third lens elements has the weak positive refractive power, the positive refractive power of the first lens element can be shared, such that the unnecessary aberration will not appear too early. On the contrary, when at least one of the second through third lens elements has the weak negative refractive power, the aberration of the optical image capturing system can be corrected and fine-tuned.

The fourth lens element may have positive refractive power and a concave image-side surface. Hereby, the back focal length is reduced for keeping the miniaturization, to miniaturize the lens element effectively. In addition, at least one of the object-side surface and the image-side surface of the four lens element may have at least one inflection point, such that the angle of incident with incoming light from an off-axis view field can be suppressed effectively and the aberration in the off-axis view field can be corrected further.

BRIEF DESCRIPTION OF THE DRAWINGS

The detailed structure, operating principle and effects of the present disclosure will now be described in more details hereinafter with reference to the accompanying drawings that show various embodiments of the present disclosure as follows.

FIG. **1**A is a schematic view of the optical image capturing system according to the first embodiment of the present application.

FIG. **1**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion grid of the optical image capturing system in the order from left to right according to the first embodiment of the present application.

FIG. **1**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through an edge of the entrance pupil and incident on the image plane by 0.7 HOI according to the first embodiment of the present application.

FIG. **2**A is a schematic view of the optical image capturing system according to the second embodiment of the present application.

FIG. **2**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion grid of the optical image capturing system in the order from left to right according to the second embodiment of the present application.

FIG. **2**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through an edge of the entrance pupil and incident on the image plane by 0.7 HOI according to the second embodiment of the present application.

FIG. **3**A is a schematic view of the optical image capturing system according to the third embodiment of the present application.

FIG. **3**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion grid of the optical image capturing system in the order from left to right according to the third embodiment of the present application.

FIG. **3**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through an edge of the entrance pupil and incident on the image plane by 0.7 HOI according to the third embodiment of the present application.

FIG. **4**A is a schematic view of the optical image capturing system according to the fourth embodiment of the present application.

FIG. **4**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion grid of the optical image capturing system in the order from left to right according to the fourth embodiment of the present application.

FIG. **4**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through an edge of the entrance pupil and incident on the image plane by 0.7 HOI according to the fourth embodiment of the present application.

FIG. **5**A is a schematic view of the optical image capturing system according to the fifth embodiment of the present application.

FIG. **5**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion grid of the optical image capturing system in the order from left to right according to the fifth embodiment of the present application.

FIG. **5**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through an edge of the entrance pupil and incident on the image plane by 0.7 HOI according to the fifth embodiment of the present application.

FIG. **6**A is a schematic view of the optical image capturing system according to the sixth embodiment of the present application.

FIG. **6**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion grid of the optical image capturing system in the order from left to right according to the sixth embodiment of the present application.

FIG. **6**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through an edge of the entrance pupil and incident on the image plane by 0.7 HOI according to the sixth embodiment of the present application.

FIG. **7** is a schematic view of the insertion mechanism of a seventh embodiment of the optical image capturing system; the method of assembling the insertion mechanism is applicable to cases of the first embodiment to the sixth embodiment; all of the bearing surfaces of image side, and all of the bearing surfaces of object side are configured to extend toward the object side and intersect with the optical axis to form angles.

FIG. **8** is a schematic view of the insertion mechanism of a eighth embodiment of the optical image capturing system; the method of assembling the insertion mechanism is applicable to cases of the first embodiment to the sixth embodiment; all of the bearing surfaces of image side, and all of the bearing surfaces of object side are configured to extend toward the image plane and intersect with the optical axis to form angles.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the exemplary embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings. Therefore, it is to be understood that the foregoing is illustrative of exemplary embodiments and is not to be construed as limited to the specific embodiments disclosed, and that modifications to the disclosed exemplary embodiments, as well as other exemplary embodiments, are intended to be included within the scope of the appended claims. These embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the inventive concept to those skilled in the art. The relative proportions and ratios of elements in the drawings may be exaggerated or diminished in size for the sake of clarity and convenience in the drawings, and such arbitrary proportions are only illustrative and not limiting in any way. The same reference numbers are used in the drawings and the description to refer to the same or like parts.

It will be understood that, although the terms 'first', 'second', 'third', etc., may be used herein to describe various elements, these elements should not be limited by these terms. The terms are used only for the purpose of distinguishing one component from another component. Thus, a first element discussed below could be termed a second element without departing from the teachings of embodiments. As used herein, the term "or" includes any and all combinations of one or more of the associated listed items.

An optical image capturing system, in order from an object side to an image side, includes a first, second, third, and fourth lens elements with refractive power and an image plane. The optical image capturing system may further include an image sensing device which is disposed on an image plane.

The optical image capturing system may use three sets of wavelengths which are 486.1 nm, 587.5 nm and 656.2 nm, respectively, wherein 587.5 nm is served as the primary reference wavelength and a reference wavelength for retrieving technical features. The optical image capturing system may also use five sets of wavelengths which are 470 nm, 510 nm, 555 nm, 610 nm and 650 nm, respectively, wherein 555 nm is served as the primary reference wavelength and a reference wavelength for retrieving technical features.

A ratio of the focal length f of the optical image capturing system to a focal length fp of each of lens elements with positive refractive power is PPR. A ratio of the focal length f of the optical image capturing system to a focal length fn of each of lens elements with negative refractive power is NPR. A sum of the PPR of all lens elements with positive refractive power is ΣPPR. A sum of the NPR of all lens elements with negative refractive powers is ΣNPR. It is beneficial to control the total refractive power and the total length of the optical image capturing system when following conditions are satisfied: $0.5 \leq \Sigma PPR/|\Sigma NPR| \leq 4.5$. Preferably, the following relation may be satisfied: $0.9 \leq \Sigma PPR/|\Sigma NPR| \leq 3.5$.

The height of the optical image capturing system is HOS. It will facilitate the manufacturing of miniaturized optical image capturing system which may form images with ultra high pixels when the specific ratio value of HOS/f tends to 1.

In the optical image capturing system of the disclosure, a distance from the object-side surface of the first lens element to the image-side surface of the fourth lens element is InTL. A total central thickness of all lens elements with refractive power on the optical axis is ΣTP. The following relation is satisfied: $0<\Sigma PP \leq 200$; and $f4/\Sigma PP \leq 0.85$. Preferably, the following relations may be satisfied: $0<\Sigma PP \leq 150$ and $0.01 \leq f4/\Sigma PP \leq 0.7$. Hereby, contrast ratio for the image formation in the optical image capturing system and defect-free rate for manufacturing the lens element can be balanced, and a proper back focal length is provided to dispose other optical components in the optical image capturing system.

The optical image capturing system may further include an image sensing device which is disposed on an image plane. Half of a diagonal of an effective detection field of the image sensing device (imaging height or the maximum image height of the optical image capturing system) is HOI. A distance on the optical axis from the object-side surface of the first lens element to the image plane is HOS. The following relations are satisfied: $HOS/HOI \leq 15$ and $0.5 \leq HOS/f \leq 20.0$. Preferably, the following relations may be satisfied: $1 \leq HOS/HOI \leq 10$ and $1 \leq HOS/f \leq 15$. Hereby, the miniaturization of the optical image capturing system can be maintained effectively, so as to be carried by lightweight portable electronic devices.

In addition, in the optical image capturing system of the disclosure, according to different requirements, at least one aperture stop may be arranged for reducing stray light and improving the imaging quality.

In the optical image capturing system of the disclosure, the aperture stop may be a front or middle aperture. The front aperture is the aperture stop between a photographed object and the first lens element. The middle aperture is the aperture stop between the first lens element and the image plane. If the aperture stop is the front aperture, a longer distance between the exit pupil and the image plane of the optical image capturing system can be formed, such that more optical elements can be disposed in the optical image capturing system and the efficiency of receiving images of the image sensing device can be raised. If the aperture stop is the middle aperture, the view angle of the optical image capturing system can be expended, such that the optical image capturing system has the same advantage that is owned by wide angle cameras. A distance from the aperture stop to the image plane is InS. The following relation is satisfied: $0.2 \leq InS/HOS \leq 1.1$. Preferably, the following relations may be satisfied: $0.4 \leq InS/HOS \leq 1$. Hereby, the miniaturization of the optical image capturing system can be maintained while the feature of the wild-angle lens element can be achieved.

In the optical image capturing system of the disclosure, a distance from the object-side surface of the first lens element to the image-side surface of the fourth lens element is InTL. A sum of central thicknesses of all lens elements with refractive power on the optical axis is ΣTP. The following relation is satisfied: $0.2 \leq \Sigma TP/InTL \leq 0.95$. Preferably, the following relation may be satisfied: $0.2 \leq \Sigma TP/InTL \leq 0.9$. Hereby, contrast ratio for the image formation in the optical image capturing system and defect-free rate for manufacturing the lens element can be given consideration simultaneously, and a proper back focal length is provided to dispose other optical components in the optical image capturing system.

A curvature radius of the object-side surface of the first lens element is R1. A curvature radius of the image-side surface of the first lens element is R2. The following relation is satisfied: $0.01 \leq |R1/R2| \leq 100$. Hereby, the first lens element may have proper strength of the positive refractive power, so as to avoid the longitudinal spherical aberration to increase too fast. Preferably, the following relation may be satisfied: $0.01 \leq |R1/R2| \leq 60$.

A curvature radius of the object-side surface of the fourth lens element is R9. A curvature radius of the image-side surface of the fourth lens element is R10. The following relation is satisfied: $-200<(R7-R8)/(R7+R8)<30$. Hereby, the astigmatism generated by the optical image capturing system can be corrected beneficially.

A distance between the first lens element and the second lens element on the optical axis is IN12. The following relation is satisfied: $0<IN12/f \leq 5.0$. Preferably, the following relations may be satisfied: $0.01 \leq IN12/f \leq 4.0$. Hereby, the chromatic aberration of the lens elements can be improved, such that the performance can be increased.

A distance between the second lens element and the third lens element on the optical axis is IN23. The following relation is satisfied: $0<IN23/f \leq 5.0$. Preferably, the following

relation may be satisfied: $0.01 \leq IN23/f \leq 3.0$. Hereby, the performance of the lens elements can be improved.

A distance between the third lens element and the fourth lens element on the optical axis is IN**34**. The following relation is satisfied: $0 < IN34/f \leq 5.0$. Preferably, the following relation may be satisfied: $0.001 \leq IN34/f \leq 3.0$. Hereby, the performance of the lens elements can be improved.

Central thicknesses of the first lens element and the second lens element on the optical axis are TP**1** and TP**2**, respectively. The following relation is satisfied: $1 \leq (TP1+IN12)/TP2 \leq 20$. Hereby, the sensitivity produced by the optical image capturing system can be controlled, and the performance can be increased.

Central thicknesses of the third lens element and the fourth lens element on the optical axis are TP**3** and TP**4**, respectively, and a distance between the aforementioned two lens elements on the optical axis is IN**34**. The following relation is satisfied: $0.2 \leq (TP4+IN34)/TP4 \leq 20$. Hereby, the sensitivity produced by the optical image capturing system can be controlled and the total height of the optical image capturing system can be reduced.

A distance between the second lens element and the third lens element on the optical axis is IN**23**. A total sum of distances from the first lens element to the fourth lens element on the optical axis is ΣTP. The following relation is satisfied: $0.01 \leq IN23/(TP2+IN23+TP3) \leq 0.9$. Preferably, the following relation may be satisfied: $0.05 \leq IN23/(TP2+IN23+TP3) \leq 0.7$. Hereby, the aberration generated by the process of moving the incident light can be adjusted slightly layer upon layer, and the total height of the optical image capturing system can be reduced.

In the optical image capturing system of the disclosure, a distance in parallel with an optical axis from a maximum effective diameter position to an axial point on the object-side surface **142** of the fourth lens element is InRS**41** (InRS**41** is positive if the horizontal displacement is toward the image-side surface, or InRS**41** is negative if the horizontal displacement is toward the object-side surface). A distance in parallel with an optical axis from a maximum effective diameter position to an axial point on the image-side surface **144** of the fourth lens element is InRS**42**. A central thickness of the fourth lens element **140** on the optical axis is TP**4**. The following relations are satisfied: $-1\ mm \leq InRS41 \leq 1\ mm$, $-1\ mm \leq InRS42 \leq 1\ mm$, $1\ mm \leq |InRS41|+|InRS42| \leq 2\ mm$, $0.01 \leq |InRS41|TP4 \leq 10$ and $0.01 \leq |InRS42/TP4 \leq 10$. Hereby, the maximum effective diameter position between both surfaces of the fourth lens element can be controlled, so as to facilitate the aberration correction of peripheral field of view of the optical image capturing system and maintain its miniaturization effectively.

In the optical image capturing system of the disclosure, a distance in parallel with an optical axis from an inflection point on the object-side surface of the fourth lens element which is nearest to the optical axis to an axial point on the object-side surface of the fourth lens element is denoted by SGI**411**. A distance in parallel with an optical axis from an inflection point on the image-side surface of the fourth lens element which is nearest to the optical axis to an axial point on the image-side surface of the fourth lens element is denoted by SGI**421**. The following relations are satisfied: $0 < SGI411/(SGI411+TP4) \leq 0.9$ and $0 < SGI421/(SGI421+TP4) \leq 0.9$. Preferably, the following relations may be satisfied: $0.01 < SGI411/(SGI411+TP4) \leq 0.7$ and $0.01 < SGI421/(SGI421+TP4) \leq 0.7$.

A distance in parallel with the optical axis from the inflection point on the object-side surface of the fourth lens element which is the second nearest to the optical axis to an axial point on the object-side surface of the fourth lens element is denoted by SGI**412**. A distance in parallel with an optical axis from an inflection point on the image-side surface of the fourth lens element which is the second nearest to the optical axis to an axial point on the image-side surface of the fourth lens element is denoted by SGI**422**. The following relations are satisfied: $0 < SGI412/(SGI412+TP4) \leq 0.9$ and $0 < SGI422/(SGI422+TP4) \leq 0.9$. Preferably, the following relations may be satisfied: $0.1 \leq SGI412/(SGI412+TP4) \leq 0.8$ and $0.1 \leq SGI422/(SGI422+TP4) \leq 0.8$.

A distance perpendicular to the optical axis between the inflection point on the object-side surface of the fourth lens element which is nearest to the optical axis and the optical axis is denoted by HIF**411**. A distance perpendicular to the optical axis between an inflection point on the image-side surface of the fourth lens element which is nearest to the optical axis and an axial point on the image-side surface of the fourth lens element is denoted by HIF**421**. The following relations are satisfied: $0.01 \leq HIF411/HOI \leq 0.9$ and $0.01 \leq HIF421/HOI \leq 0.9$. Preferably, the following relations may be satisfied: $0.09 \leq HIF411/HOI \leq 0.5$ and $0.09 \leq HIF421/HOI \leq 0.5$.

A distance perpendicular to the optical axis between the inflection point on the object-side surface of the fourth lens element which is the second nearest to the optical axis and the optical axis is denoted by HIF**412**. A distance perpendicular to the optical axis between an axial point on the image-side surface of the fourth lens element and an inflection point on the image-side surface of the fourth lens element which is the second nearest to the optical axis is denoted by HIF**422**. The following relations are satisfied: $0.01 \leq HIF412/HOI \leq 0.9$ and $0.01 \leq HIF422/HOI \leq 0.9$. Preferably, the following relations may be satisfied: $0.09 \leq HIF412/HOI \leq 0.8$ and $0.09 \leq HIF422/HOI \leq 0.8$.

A distance perpendicular to the optical axis between the inflection point on the object-side surface of the fourth lens element which is the third nearest to the optical axis and the optical axis is denoted by HIF**413**. A distance perpendicular to the optical axis between an axial point on the image-side surface of the fourth lens element and an inflection point on the image-side surface of the fourth lens element which is the third nearest to the optical axis is denoted by HIF**423**. The following relations are satisfied: $0.001\ mm \leq |HIF413| \leq 5\ mm$ and $0.001\ mm \leq |HIF423| \leq 5\ mm$. Preferably, the following relations may be satisfied: $0.1\ mm \leq |HIF423| \leq 3.5\ mm$ and $0.1\ mm \leq |HIF413| \leq 13.5\ mm$.

A distance perpendicular to the optical axis between the inflection point on the object-side surface of the fourth lens element which is the fourth nearest to the optical axis and the optical axis is denoted by HIF**414**. A distance perpendicular to the optical axis between an axial point on the image-side surface of the fourth lens element and an inflection point on the image-side surface of the fourth lens element which is the fourth nearest to the optical axis is denoted by HIF**424**. The following relations are satisfied: $0.001\ mm \leq |HIF414| \leq 5\ mm$ and $0.001\ mm \leq |HIF424| \leq 5\ mm$. Preferably, the following relations may be satisfied: $0.1\ mm \leq |HIF424| \leq 3.5\ mm$ and $0.1\ mm \leq |HIF414| \leq 3.5\ mm$.

In one embodiment of the optical image capturing system of the present disclosure, the chromatic aberration of the optical image capturing system can be corrected by alternatively arranging the lens elements with large Abbe number and small Abbe number.

The above Aspheric formula is:

$$z=ch^2/[1+[1-(k+1)c^2h^2]^{0.5}]+A4h^4+A6h^6+A8h^8+A10h^{10}+A12h^{12}+A14h^{14}+A16h^{16}+A18h^{18}+A20h^{20}+\ldots \quad (1),$$

where z is a position value of the position along the optical axis and at the height h which reference to the surface apex; k is the conic coefficient, c is the reciprocal of curvature radius, and A4, A6, A8, A10, A12, A14, A16, A18, and A20 are high order aspheric coefficients.

The optical image capturing system provided by the disclosure, the lens elements may be made of glass or plastic material. If plastic material is adopted to produce the lens elements, the cost of manufacturing will be lowered effectively. If lens elements are made of glass, the heat effect can be controlled and the designed space arranged for the refractive power of the optical image capturing system can be increased. Besides, the object-side surface and the image-side surface of the first through fourth lens elements may be aspheric, so as to obtain more control variables. Comparing with the usage of traditional lens element made by glass, the number of lens elements used can be reduced and the aberration can be eliminated. Thus, the total height of the optical image capturing system can be reduced effectively.

In addition, in the optical image capturing system provided by the disclosure, if the lens element has a convex surface, the surface of the lens element is convex adjacent to the optical axis. If the lens element has a concave surface, the surface of the lens element is concave adjacent to the optical axis.

Besides, in the optical image capturing system of the disclosure, according to different requirements, at least one aperture may be arranged for reducing stray light and improving the imaging quality.

The optical image capturing system of the disclosure can be adapted to the optical image capturing system with automatic focus if required. With the features of a good aberration correction and a high quality of image formation, the optical image capturing system can be used in various application fields.

The optical image capturing system of the disclosure can include a driving module according to the actual requirements. The driving module may be coupled with the lens elements to enable the lens elements producing displacement. The driving module described above may be the voice coil motor (VCM) which is applied to move the lens to focus, or may be the optical image stabilization (OIS) which is applied to reduce the distortion frequency owing to the vibration of the lens while shooting.

At least one lens element among the first lens element, the second lens element, the third lens element and the fourth lens element of the optical image capturing system of the present disclosure may be a light filtration element which filters light with wavelength of less than 500 nm according to the actual requirements. The light filtration element may be made by coating film on at least one surface of the lens element with the specific filtration function or the lens element per se is designed with the material which is able to filter the short wavelength.

The image plane of the present invention may be a plane or a curved surface based on requirement. When the image plane is a curved surface, it reduces the accident angle the image plane needs to focus light. In addition to achieving reducing the length of the system, it also promotes the relative illumination.

In the optical image capturing system of the present invention, each object-side surface of each lens element may have a beating surface of object side depending on the requirement, and the image-side surface thereof has a bearing surface of image side. Depending on the requirement, the bearing surface of object side and the bearing surface of image side of each lens element may be respectively configured to be mutually inserted to the adjacent front lens element and the adjacent rear lens element via the contact surfaces thereof, so as to form a stacked structure. The length of the outline of the contact surface in the radial direction of the lens is denoted by BSL, which satisfies condition as follows: 0.01 mm≤BSL≤1 mm. In a preferred embodiment, condition as follows is satisfied: 0.05 mm≤BSL≤0.5 mm. In the most preferred embodiment, condition as follows is satisfied: 0.08 mm≤BSL≤0.2 mm.

In the optical image capturing system of the present invention, the stacked structure may be designed as a single-insertion structure based on requirement, e.g. the first lens element has a first bearing surface of image side on the image-side surface thereof, and the second lens element has a second bearing surface of object side on the object-side surface thereof, such that the second bearing surface of object side contacts with the first bearing surface of image side and both of them are inserted to each other. Alternatively, the stacked structure may be designed as a double-insertion structure, e.g. a double-insertion structure is provided on the basis of the single-insertion structure. The second lens element has a second bearing surface of image side, the third lens element has a third bearing surface of object side, and the third bearing surface of object side contacts with the second bearing surface of image side such that both of them are inserted to each other.

Alternatively, the structure can be a triple-insertion structure or a full-insertion structure. An optical image capturing system with seven-piece optical lenses, for example, is provided on the basis of double-insertion structure. The third lens element has a third bearing surface of image side on the image-side surface thereof, the fourth lens element has a fourth bearing surface of object side on the object-side surface thereof, and the fourth bearing surface of object side contacts with the third bearing surface of image side such that both of them are inserted to each other. The fourth lens element has a fourth bearing surface of image side on the image-side surface thereof, the fifth lens element has a fifth bearing surface of object side on the object-side surface thereof, and the fifth bearing surface of object side contacts with the fourth bearing surface of image side such that both of them are inserted to each other. The fifth lens element has a fifth bearing surface of image side on the image-side surface thereof, the sixth lens element has a sixth bearing surface of object side on the object-side surface thereof, and the sixth bearing surface of object side contacts with the fifth bearing surface of image side such that both of them are inserted to each other, The sixth lens element has a bearing surface of image side on the image-side surface thereof, the seventh lens element has a seventh bearing surface of object side on the object-side surface thereof, and the seventh bearing surface of object side contacts with the sixth bearing surface of image side such that both of them are inserted to each other.

Depending on the requirement, the extension lines of the first to seventh bearing surfaces of image side may be configured to extend toward the object side or the image plane and intersect with the optical axis to form angles IAG, which are denoted by IAG1, IAG2, IAG3, IAG4, IAG5, IAG6 and IAG7, respectively; condition as follows is satisfied: 0 deg<IAG≤90 deg. The values of the aforementioned angles IAG1 to IAG7 may vary in order to meet the practical

requirement of the specification of the optical image capturing system. In a preferred embodiment, condition as follows may be imposed: 0 deg<IAG≤45 deg. In the best mode the following condition may be imposed: 0 deg<IAG≤30 deg and IAG**1** to IAG**7** are equivalent angles, i.e. IAG**1**=IAG**2**=IAG**3**=IAG**4**=IAG**5**=IAG**6**=IAG**7**.

Take the full-insertion structure of the aforementioned optical image capturing system with seven-piece lenses for example, the extension lines of the first to seventh bearing surfaces of object side may be configured to extend toward the object side or the image plane and intersect with the optical axis to form angles OAG, which are denoted by OAG**1**, OAG**2**, OAG**3**, OAG**4**, OAG**5**, OAG**6** and OAG**7**, respectively; condition as follows is satisfied: 0 deg<OAG≤90 deg. The values of the aforementioned angles OAG**1** to OAG**7** may vary in order to meet the practical requirement of the specification of the optical image capturing system. In a preferred embodiment, condition as follows may be imposed: 0 deg<OAG≤45 deg. In the best mode, the following condition may be imposed: 0 deg<OAG≤30 deg and OAG**1** to OAG**7** are equivalent angles, i.e. OAG**1**=OAG**2**=OAG**3**=OAG**4**=OAG**5**=OAG**6**=OAG**7**.

Referring to FIG. **7**, which is a schematic view of the insertion mechanism of a seventh embodiment of the optical image capturing system; the method of assembling the insertion mechanism is applicable to cases of the first embodiment to the sixth embodiment; all of the bearing surfaces of image side, and all of the bearing surfaces of object side are configured to extend toward the object side and intersect with the optical axis to form angles; wherein the angles IAG**1** to IAG**4** and the angles OAG**1** to OAG**4** are identical, and are set at 25 deg. In the order from object side to image side, the optical image capturing system includes: an aperture stop **700**, a first lens element **710**, a second lens element **720**, a third lens element **730**, a fourth lens element **740** and an image plane **790**. The first lens element has a first bearing surface of image side **718** at the image-side surface thereof; the second lens element has a second bearing surface of object side **726** at the object-side surface thereof and has a second bearing surface of image side **728** at the image-side surface thereof. The second bearing surface of object side **726** and the first bearing surface of image side **718** come into contact with each other. The third lens element has a third bearing surface of object side **736** at the object-side surface thereof and has a third bearing surface of image side **738** at the image-side surface thereof. The third bearing surface of object side **736** and the second bearing surface of image side **728** come into contact with each other. The fourth lens element has a fourth bearing surface of object side **746** at the object-side surface thereof and has a fourth bearing surface of image side **748** at the image-side surface thereof. The fourth bearing surface of object side **746** and the third bearing surface of image side **738** come into contact with each other. The bearing surface of object side and the bearing surface of image side of each lens element may be respectively and mutually inserted to the adjacent front lens element and the adjacent rear lens element via the contact surfaces thereof, so as to form a stacked structure.

Referring to FIG. **8**, which is schematic view of the insertion mechanism of a eighth embodiment of the optical image capturing system; the method of assembling the insertion mechanism is applicable to cases of the first embodiment to the sixth embodiment; all of the bearing surfaces of image side, and all of the bearing surfaces of object side are configured to extend toward the image plane and intersect with the optical axis to form angles. Wherein the angles IAG**1** to IAG**4** and the angles OAG**1** to OAG**4** are identical, and are set at 25 deg. In the order from object side to image side, the optical image capturing system includes: an aperture stop **800**, a first lens element **810**, a second lens element **820**, a third lens element **830**, a fourth lens element **840** and an image plane **890**. The first lens element has a first bearing surface of image side **818** at the image-side surface thereof; the second lens element has a second bearing surface of object side **826** at the object-side surface thereof and has a second bearing surface of image side **828** at the image-side surface thereof. The second bearing surface of object side **826** and the first bearing surface of image side **818** come into contact with each other. The third lens element has a third bearing surface of object side **836** at the object-side surface thereof and has a third bearing surface of image side **838** at the image-side surface thereof. The third bearing surface of object side **836** and the second bearing surface of image side **828** come into contact with each other. The fourth lens element has a fourth bearing surface of object side **846** at the object-side surface thereof and has a fourth bearing surface of image side **848** at the image-side surface thereof. The fourth bearing surface of object side **846** and the third bearing surface of image side **838** come into contact with each other. The bearing surface of object side and the bearing surface of image side of each lens element may be respectively and mutually inserted to the adjacent front lens element and the adjacent rear lens element via the contact surfaces thereof, so as to form a stacked structure.

According to the above embodiments, the specific embodiments with figures are presented in detail as below.

The First Embodiment (Embodiment 1)

Please refer to FIG. **1**A, FIG. **1**B, and FIG. **1**C. FIG. **1**A is a schematic view of the optical image capturing system according to the first embodiment of the present application, FIG. **1**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion curve of the optical image capturing system in the order from left to right according to the first embodiment of the present application, and FIG. **1**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through 0.7 view field of STA of the optical image capturing system according to the first embodiment of the present application. As shown in FIG. **1**A, in order from an object side to an image side, the optical image capturing system includes a first lens element **110**, a second lens element **120**, an aperture **100**, a third lens element **130**, a fourth lens element **140**, an IR-bandstop filter **170**, an image plane **180**, and an image sensing device **190**.

The first lens element **110** has negative refractive power and it is made of glass material. The first lens element **110** has a convex object-side surface **112** and a concave image-side surface **114**, and both of the object-side surface **112** and the image-side surface **114** are aspheric. The length of outline curve of the maximum effective half diameter position of the object-side surface of the first lens element is denoted as ARS**11**. The length of outline curve of the maximum effective half diameter position of the image-side surface of the first lens element is denoted as ARS**12**. The length of outline curve of a half of an entrance pupil diameter (HEP) of the object-side surface of the first lens element is denoted as ARE**11**, and the length of outline curve of the half of the entrance pupil diameter (HEP) of the image-side surface of the first lens element is denoted as ARE12. The thickness of the first lens element on the optical axis is TP1.

A distance in parallel with an optical axis from an inflection point on the object-side surface of the first lens element which is nearest to the optical axis to an axial point on the object-side surface of the first lens element is denoted by SGI111. A distance in parallel with an optical axis from an inflection point on the image-side surface of the first lens element which is nearest to the optical axis to an axial point on the image-side surface of the first lens element is denoted by SGI121. The following relations are satisfied: SGI111=0 mm, SGI121=0 mm, |SGI111|/(|SGI111|+TP1)=0 and |SGI121|/(|SGI121|+TP1)=0.

A distance perpendicular to the optical axis from the inflection point on the object-side surface of the first lens element which is nearest to the optical axis to an axial point on the object-side surface of the first lens element is denoted by HIF111. A distance perpendicular to the optical axis from the inflection point on the image-side surface of the first lens element which is nearest to the optical axis to an axial point on the image-side surface of the first lens element is denoted by HIF121. The following relations are satisfied: HIF111=0 mm, HIF121=0 mm, HIF111/HOI=0 and HIF121/HOI=0.

The second lens element **120** has positive refractive power and it is made of plastic material. The second lens element **120** has a concave object-side surface **122** and a convex image-side surface **124**, and both of the object-side surface **122** and the image-side surface **124** are aspheric. The object-side surface **122** has an inflection point. The length of outline curve of the maximum effective half diameter position of the object-side surface of the second lens element is denoted as ARS21, and the length of outline curve of the maximum effective half diameter position of the image-side surface of the second lens element is denoted as ARS22. The length of outline curve of a half of an entrance pupil diameter (HEP) of the object-side surface of the second lens element is denoted as ARE21, and the length of outline curve of the half of the entrance pupil diameter (HEP) of the image-side surface of the second lens element is denoted as ARE22. The thickness of the second lens element on the optical axis is TP2.

A distance in parallel with an optical axis from an inflection point on the object-side surface of the second lens element which is nearest to the optical axis to an axial point on the object-side surface of the second lens element is denoted by SGI211. A distance in parallel with an optical axis from an inflection point on the image-side surface of the second lens element which is nearest to the optical axis to an axial point on the image-side surface of the second lens element is denoted by SGI221. The following relations are satisfied: SGI211=−0.13283 mm and |SGI211|/(|SGI211|+TP2)=0.05045.

A distance perpendicular to the optical axis from the inflection point on the object-side surface of the second lens element which is nearest to the optical axis to an axial point on the object-side surface of the second lens element is denoted by HIF211. A distance perpendicular to the optical axis from the inflection point on the image-side surface of the second lens element which is nearest to the optical axis to an axial point on the image-side surface of the second lens element is denoted by HIF221. The following relations are satisfied: HIF211=2.10379 mm and HIF211/HOI=0.69478.

The third lens element **130** has negative refractive power and it is made of plastic material. The third lens element **130** has a concave object-side surface **132** and a concave image-side surface **134**, and both of the object-side surface **132** and the image-side surface **134** are aspheric. The image-side surface **134** has an inflection point. The length of outline curve of the maximum effective half diameter position of the object-side surface of the third lens element is denoted as ARS31, and the length of outline curve of the maximum effective half diameter position of the image-side surface of the third lens element is denoted as ARS32. The length of outline curve of a half of an entrance pupil diameter (HEP) of the object-side surface of the third lens element is denoted as ARE31, and the length of outline curve of the half of the entrance pupil diameter (HEP) of the image-side surface of the third lens element is denoted as ARE32. The thickness of the third lens element on the optical axis is TP3.

A distance in parallel with an optical axis from an inflection point on the object-side surface of the third lens element which is nearest to the optical axis to an axial point on the object-side surface of the third lens element is denoted by SGI311. A distance in parallel with an optical axis from an inflection point on the image-side surface of the third lens element which is nearest to the optical axis to an axial point on the image-side surface of the third lens element is denoted by SGI321. The following relations are satisfied: SGI321=0.01218 mm and |SGI321|/(|SGI321|+TP3)=0.03902.

A distance perpendicular to the optical axis between the inflection point on the object-side surface of the third lens element which is nearest to the optical axis and the optical axis is denoted by HIF311. A distance perpendicular to the optical axis from the inflection point on the image-side surface of the third lens element which is nearest to the optical axis to an axial point on the image-side surface of the third lens element is denoted by HIF321. The following relations are satisfied: HIF321=0.84373 mm and HIF321/HOI=0.27864.

The fourth lens element **140** has positive refractive power and it is made of plastic material. The fourth lens element **140** has a convex object-side surface **142** and a convex image-side surface **144**, both of the object-side surface **142** and the image-side surface **144** are aspheric, and the image-side surface **144** has an inflection point. The length of outline curve of the maximum effective half diameter position of the object-side surface of the fourth lens element is denoted as ARS41, and the length of outline curve of the maximum effective half diameter position of the image-side surface of the fourth lens element is denoted as ARS42. The length of outline curve of a half of an entrance pupil diameter (HEP) of the object-side surface of the fourth lens element is denoted as ARE41, and the length of outline curve of the half of the entrance pupil diameter (HEP) of the image-side surface of the fourth lens element is denoted as ARS42. The thickness of the fourth lens element on the optical axis is TP4.

A distance in parallel with an optical axis from an inflection point on the object-side surface of the fourth lens element which is nearest to the optical axis to an axial point on the object-side surface of the fourth lens element is denoted by SGI411. A distance in parallel with an optical axis from an inflection point on the image-side surface of the fourth lens element which is nearest to the optical axis to an axial point on the image-side surface of the fourth lens element is denoted by SGI421. The following relations are satisfied: SGI411=0 mm, SGI421=−0.41627 mm, |SGI411|/(|SGI411|+TP4)=0 and |SGI421|/(|SGI421|+TP4)=0.25015.

A distance in parallel with the optical axis from an inflection point on the object-side surface of the fourth lens element which is the second nearest to the optical axis to an axial point on the object-side surface of the fourth lens element is denoted by SGI412. The following relations are satisfied: SGI412=0 mm and |SGI412|/(|SGI412|+TP4)=0.

A distance perpendicular to the optical axis between the inflection point on the object-side surface of the fourth lens element which is nearest to the optical axis and the optical axis is denoted by HIF411. A distance perpendicular to the optical axis between the inflection point on the image-side surface of the fourth lens element which is nearest to the optical axis and the optical axis is denoted by HIF421. The following relations are satisfied: HIF411=0 mm, HIF421=1.55079 mm, HIF411/HOI=0 and HIF421/HOI=0.51215.

A distance perpendicular to the optical axis between the inflection point on the object-side surface of the fourth lens element which is the second nearest to the optical axis and the optical axis is denoted by HIF412. The following relations are satisfied: HIF412=0 mm and HIF412/HOI=0.

The IR-bandstop filter **170** is made of glass material without affecting the focal length of the optical image capturing system and it is disposed between the fourth lens element **140** and the image plane **180**.

In the optical image capturing system of the first embodiment, a focal length of the optical image capturing system is f, an entrance pupil diameter of the optical image capturing system is HEP, and half of a maximal view angle of the optical image capturing system is HAF. The detailed parameters are shown as below: f=2.6841 mm, f/HEP=2.7959, HAF=70° and tan(HAF)=2.7475.

In the optical image capturing system of the first embodiment, a focal length of the first lens element **110** is f1 and a focal length of the fourth lens element **140** is f4. The following relations are satisfied: f1=−5.4534 mm, |f/f1|=0.4922, f4=2.7595 mm and |f1/f4|=1.9762.

In the optical image capturing system of the first embodiment, focal lengths of the second lens element **120** and the third lens element **130** are f2 and f3, respectively. The following relations are satisfied: |f2|+|f3|=13.2561 mm, |f1|+|f4|=8.2129 mm and |f2|+|f3|>|f1|+|f4|.

A ratio of the focal length f of the optical image capturing system to a focal length fp of each of lens elements with positive refractive power is PPR. A ratio of the focal length f of the optical image capturing system to a focal length fn of each of lens elements with negative refractive power is NPR. In the optical image capturing system of the first embodiment, a sum of the PPR of all lens elements with positive refractive power is ΣPPR=|f/f2|+|f/f4|=1.25394. A sum of the NPR of all lens elements with negative refractive powers is ΣNPR=|f/f1|+|f/f2|=1.21490, ΣPPR/|ΣNPR|=1.03213. The following relations are also satisfied: |f/f1|=0.49218, |f/f2|=0.28128, |f/f3|=0.72273, and |f/f4|=0.97267.

In the optical image capturing system of the first embodiment, a distance from the object-side surface **112** of the first lens element to the image-side surface **144** of the fourth lens element is InTL. A distance from the object-side surface **112** of the first lens element to the image plane **180** is HOS. A distance from an aperture **100** to an image plane **180** is InS. Half of a diagonal length of an effective detection field of the image sensing device **190** is HOI. A distance from the image-side surface **144** of the fourth lens element to an image plane **180** is InB. The following relations are satisfied: InTL+InB=HOS, HOS=18.74760 mm, HOI=3.088 mm, HOS/HOI=6.19141, HOS/f=6.9848, InTL/HOS=0.6605, InS=8.2310 mm, and InS/HOS=0.4390

In the optical image capturing system of the first embodiment, the sum of central thicknesses of all lens elements with refractive power on the optical axis is ΣTP. The following relations are satisfied: ΣTP=4.9656 mm, and ΣTP/InTL=0.4010. Hereby, contrast ratio for the image formation in the optical image capturing system and defect-free rate for manufacturing the lens element can be given consideration simultaneously, and a proper back focal length is provided to dispose other optical components in the optical image capturing system.

In the optical image capturing system of the first embodiment, a curvature radius of the object-side surface **112** of the first lens element is R1. A curvature radius of the image-side surface **114** of the first lens element is R2. The following relation is satisfied: |R1/R2|=9.6100. Hereby, the first lens element may have proper strength of the positive refractive power, so as to avoid the longitudinal spherical aberration to increase too fast.

In the optical image capturing system of the first embodiment, a curvature radius of the object-side surface **142** of the fourth lens element is R7. A curvature radius of the image-side surface **144** of the fourth lens element is R8. The following relation is satisfied: (R7−R8)/(R7+R8)=−35.5932. Hereby, the astigmatism generated by the optical image capturing system can be corrected beneficially.

In the optical image capturing system of the first embodiment, a sum of focal lengths of all lens elements with positive refractive power is ΣPP. The following relations are satisfied: ΣPP=12.30183 mm and f4/ΣPP=0.22432. Hereby, it is favorable for allocating the positive refractive power of the fourth lens element **140** to other positive lens elements and the significant aberrations generated in the process of moving the incident light can be suppressed.

In the optical image capturing system of the first embodiment, a sum of focal lengths of all lens elements with negative refractive power is ΣNP. The following relations are satisfied: ΣNP=−14.6405 mm and f1/ΣNP=0.59488. Hereby, it is favorable for allocating the negative refractive power of the fourth lens element **140** to other negative lens elements and the significant aberrations generated in the process of moving the incident light can be suppressed.

In the optical image capturing system of the first embodiment, a distance between the first lens element **110** and the second lens element **120** on the optical axis is IN12. The following relations are satisfied: IN12=4.5709 mm and IN12/f=1.70299. Hereby, the chromatic aberration of the lens elements can be improved, such that the performance can be increased.

In the optical image capturing system of the first embodiment, a distance between the second lens element **120** and the third lens element **130** on the optical axis is IN23. The following relations are satisfied: IN23=2.7524 mm and IN23/f=1.02548. Hereby, the chromatic aberration of the lens elements can be improved, such that the performance can be increased.

In the optical image capturing system of the first embodiment, a distance between the third lens element **130** and the fourth lens element **140** on the optical axis is IN34. The following relations are satisfied: IN34=0.0944 mm and IN34/f=0.03517. Hereby, the chromatic aberration of the lens elements can be improved, such that the performance can be increased.

In the optical image capturing system of the first embodiment, central thicknesses of the first lens element **110** and the second lens element **120** on the optical axis are TP1 and TP2, respectively. The following relations are satisfied: TP1=0.9179 mm, TP2=2.5000 mm, TP1/TP2=0.36715 and (TP1+IN12)/TP2=2.19552. Hereby, the sensitivity produced by the optical image capturing system can be controlled, and the performance can be increased.

In the optical image capturing system of the first embodiment, central thicknesses of the third lens element **130** and the fourth lens element **140** on the optical axis are TP**3** and TP**4**, respectively, and a distance between the aforementioned two lens elements on the optical axis is IN**34**. The following relations are satisfied: TP**3**=0.3 mm, TP**4**=1.2478 mm, TP**3**/TP**4**=0.24043 and (TP**4**+IN**34**)/TP**3**=4.47393. Hereby, the sensitivity produced by the optical image capturing system can be controlled and the total height of the optical image capturing system can be reduced.

In the optical image capturing system of the first embodiment, the following relations are satisfied: IN**23**/(TP**2**+IN**23**+TP**3**)=0.49572. Hereby, the aberration generated by the process of moving the incident light can be adjusted slightly layer upon layer, and the total height of the optical image capturing system can be reduced.

A distance in parallel with an optical axis from a maximum effective diameter position to an axial point on the object-side surface **142** of the fourth lens element is InRS**41**. A distance in parallel with an optical axis from a maximum effective diameter position to an axial point on the image-side surface **144** of the fourth lens element is InRS**42**. A central thickness of the fourth lens element **140** on the optical axis is TP**4**. The following relations are satisfied: InRS**41**=0.2955 mm, InRS**42**=−0.4940 mm, |InRS**41**|+|InRS**42**|=0.7894 mm, |InRS**41**|/TP**4**=0.23679 and |InRS**42**|/TP**4**=0.39590. Hereby, it is favorable to the manufacturing and formation of the lens elements and to maintain its miniaturization effectively.

In the optical image capturing system of the first embodiment, a distance perpendicular to the optical axis between a critical point C**41** on the object-side surface **142** of the fourth lens element and the optical axis is HVT**41**. A distance perpendicular to the optical axis between a critical point C**42** on the image-side surface **144** of the fourth lens element and the optical axis is HVT**42**. The following relations are satisfied: HVT**41**=0 mm and HVT**42**=0 mm.

In the optical image capturing system of the first embodiment, the following relation is satisfied: HVT**42**/HOI=0.

In the optical image capturing system of the first embodiment, the following relation is satisfied: HVT**42**/HOS=0.

In the optical image capturing system of the first embodiment, an Abbe number of the first lens element is NA**1**. An Abbe number of the second lens element is NA**2**. An Abbe number of the third lens element is NA**3**. An Abbe number of the fourth lens element is NA**4**. The following relations are satisfied: |NA**1**−NA**2**|=0.0351. Hereby, the chromatic aberration of the optical image capturing system can be corrected.

In the optical image capturing system of the first embodiment, TV distortion and optical distortion for image formation in the optical image capturing system are TDT and ODT, respectively. The following relations are satisfied: |TDT|=37.4846% and |ODT|=−55.3331%.

In the optical image capturing system of the first embodiment, a lateral aberration of the longest operation wavelength of a positive direction tangential fan of the optical image capturing system passing through an edge of the aperture and incident on the image plane by 0.7 view field is denoted as PLTA, which is −0.018 mm. A lateral aberration of the shortest operation wavelength of the positive direction tangential fan of the optical image capturing system passing through the edge of the aperture and incident on the image plane by 0.7 view field is denoted as PSTA, which is 0.010 mm. A lateral aberration of the longest operation wavelength of a negative direction tangential fan of the optical image capturing system passing through the edge of the aperture and incident on the image plane by 0.7 view field is denoted as NLTA, which is 0.003 mm. A lateral aberration of the shortest operation wavelength of a negative direction tangential fan of the optical image capturing system passing through the edge of the aperture and incident on the image plane by 0.7 view field is denoted as NSTA, which is −0.003 mm. A lateral aberration of the longest operation wavelength of a sagittal fan of the optical image capturing system passing through the edge of the aperture and incident on the image plane by 0.7 view field is denoted as SLTA, which is −0.010 mm. A lateral aberration of the shortest operation wavelength of the sagittal fan of the optical image capturing system passing through the edge of the aperture and incident on the image plane by 0.7 view field is denoted as SSTA, which is 0.003 mm.

In the present embodiment of the optical image capturing system, all of the bearing surfaces of image side and all of the bearing surfaces of object side of the lens elements are configured to extend toward the image plane and intersect with the optical axis to form angles, wherein the angles IAG**1** to IAG**2** and OAG**2** to OAG**3** are the same, and are set to 90 deg. The lens elements form a stacked structure via the contact surfaces thereof that mutually insert one lens element to another, the lengths of the outlines of all of the aforementioned contact surfaces in the radial direction of the lens are denoted by BSL, which satisfy the following conditions: BSL=0.1 mm.

Please refer to the following Table 1 and Table 2.

The detailed data of the optical image capturing system of the first embodiment is as shown in Table 1.

TABLE 1

Lens Parameters for the First Embodiment
f(focal length) = 2.6841 mm; f/HEP = 2.7959; HAF(half angle of view) = 70 deg; tan(HAF) = 2.7475

Surface No.		Curvature Radius	Central Thickness (mm)	Material	Refractive Index	Abbe No.	Focal Length
0	Object	Plane	At Infinity				
1	Lens 1	31.98102785	0.918	Glass	1.688	50.26	−5.453
2		3.327880578	4.571				
3	Lens 2	−15.2556818	2.500	Plastic	1.642	22.46	9.542
4		−4.681543531	2.528				

TABLE 1-continued

Lens Parameters for the First Embodiment f(focal length) = 2.6841 mm; f/HEP = 2.7959; HAF(half angle of view) = 70 deg; tan(HAF) = 2.7475							
Surface No.		Curvature Radius	Central Thickness (mm)	Material	Refractive Index	Abbe No.	Focal Length
5	Aperture Stop	Plane	0.225				
6	Lens 3	−2.453543123	0.300	Plastic	1.642	22.46	−3.714
7		127.8664454	0.094				
8	Lens 4	2.697747363	1.248	Plastic	1.544	56.09	2.759
9		−2.853715061	0.725				
10	IR-bandstop filter	Plane	2.000	*BK7_ SCHOTT*	1.517	64.13	
11		Plane	3.640				
12	Image Plane	Plane					

Reference Wavelength = 555 nm; Shielding Position: The 3rd surface with clear aperture of 3.0 mm

As for the parameters of the aspheric surfaces of the first embodiment, reference is made to Table 2.

TABLE 2

Aspheric Coefficients						
Surface#	3	4	6	7	8	9
k=	−2.918829E+01	−3.214789E+00	−1.504539E+01	−2.970417E+01	−1.613370E+01	−1.145951E+00
A4=	−9.004096E−04	−9.725260E−06	8.890018E−05	3.634454E−02	9.587367E−03	−4.742020E−03
A6=	2.391364E−04	−8.096303E−05	−1.166688E−02	−3.060142E−02	−3.693991E−03	1.232422E−03
A8=	−2.421089E−05	7.787465E−07	−5.720942E−04	8.833265E−03	8.653836E−04	3.333400E−04
A10=	1.716292E−06	3.517517E−07	8.305770E−04	−1.362695E−03	−7.093620E−05	−2.583094E−06
A12=	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00

The relevant data of the length of outline curve may be deduced from Table 1 and Table 2.

First embodiment (Primary reference wavelength: 555 nm)						
ARE	1/2(HEP)	ARE value	ARE-1/2(HEP)	2(ARE/HEP) %	TP	ARE/TP (%)
11	0.480	0.480	0.000	100.00%	0.918	52.30%
12	0.480	0.482	0.002	100.35%	0.918	52.48%
21	0.480	0.480	0.000	100.02%	2.500	19.20%
22	0.480	0.481	0.001	100.17%	2.500	19.23%
31	0.480	0.482	0.002	100.49%	0.300	160.78%
32	0.480	0.480	0.000	100.00%	0.300	160.00%
41	0.480	0.482	0.002	100.42%	1.248	38.63%
42	0.480	0.482	0.002	100.47%	1.248	38.65%
ARS	EHD	ARS value	ARS-EHD	(ARS/EHD) %	TP	ARS/TP (%)
11	5.943	5.978	0.035	100.58%	0.918	651.27%
12	3.236	4.439	1.204	137.20%	0.918	483.66%
21	3.000	3.007	0.007	100.24%	2.500	120.29%
22	2.855	2.983	0.128	104.49%	2.500	119.33%
31	1.061	1.079	0.017	101.61%	0.300	359.54%
32	1.293	1.292	−0.001	99.95%	0.300	430.77%
41	1.642	1.676	0.034	102.06%	1.248	134.30%
42	1.767	1.859	0.092	105.21%	1.248	148.98%

Table 1 is the detailed structure data to the first embodiment in FIG. **1**A, wherein the unit of the curvature radius, the thickness, the distance, and the focal length is millimeters (mm). Surfaces 0-12 illustrate the surfaces from the object side to the image plane in the optical image capturing system. Table 2 is the aspheric coefficients of the first embodiment, wherein k is the conic coefficient in the aspheric surface formula, and A1-A12 are the first to the twentieth order aspheric surface coefficient. Besides, the tables in the following embodiments are referenced to the schematic view and the aberration graphs, respectively, and definitions of parameters in the tables are equal to those in the Table 1 and the Table 2, so the repetitious details will not be given here.

The Second Embodiment (Embodiment 2)

Please refer to FIG. **2**A, FIG. **2**B, and FIG. **2**C. FIG. **2**A is a schematic view of the optical image capturing system according to the second embodiment of the present application, FIG. **2**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion curve of the optical image capturing system in the order from left to right according to the second embodiment of the present application, and FIG. **2**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through 0.7 view field of STA of the optical image capturing system according to the second embodiment of the present application. As shown in FIG. **2**A, in order from an object side to an image side, the optical image capturing system includes a first lens element **210**, a second lens element **220**, an aperture stop **200**, a third lens element **230**, a fourth lens element **240**, an IR-bandstop filter **270**, an image plane **280**, and an image sensing device **290**. In the present embodiment, all of the bearing surfaces of image side and all of the bearing surfaces of object side of the lens elements are configured to extend toward the object side and intersect with the optical axis to form angles (not shown).

The first lens element **210** has negative refractive power and it is made of plastic material. The first lens element **210** has a convex object-side surface **212** and a concave image-side surface **214**, and both of the object-side surface **212** and the image-side surface **214** are aspheric and have an inflection point.

The second lens element **220** has positive refractive power and it is made of plastic material. The second lens element **220** has a convex object-side surface **222** and a convex image-side surface **224**, and both of the object-side surface **222** and the image-side surface **224** are aspheric. The object-side surface **222** has an inflection point.

The third lens element **230** has positive refractive power and it is made of plastic material. The third lens element **230** has a concave object-side surface **232** and a convex image-side surface **234**, and both of the object-side surface **232** and the image-side surface **234** are aspheric and have one inflection point.

The fourth lens element **240** has negative power and it is made of plastic material. The fourth lens element **240** has a convex object-side surface **242** and a concave image-side surface **244**, and both of the object-side surface **242** and the image-side surface **244** are aspheric, and have an inflection point.

The IR-bandstop filter **270** is made of glass material without affecting the focal length of the optical image capturing system and it is disposed between the fourth lens element **240** and the image plane **280**.

In the optical image capturing system of the second embodiment, the second lens element **220** and the third lens element **230** are both positive lens elements and focal lengths of the second lens element **220** and the third lens element **230** are f**2** and f**3**, respectively. A sum of focal lengths of all lens elements with positive refractive power is ΣPP. The following relation is satisfied: ΣPP=f**2**+f**3**. Hereby, it is favorable for allocating the positive refractive power of the third lens element **230** to other positive lens elements and the significant aberrations generated in the process of moving the incident light can be suppressed.

In the optical image capturing system of the second embodiment, focal lengths of the first lens element **210** and the fourth lens element **240** are f**1** and f**4**, respectively. A sum of focal lengths of all lens elements with negative refractive power is ΣNP. The following relation is satisfied: ΣPP=f**1**+f**4**. Hereby, it is favorable for allocating the negative refractive power of the first lens element **210** to other negative lens elements.

Please refer to the following Table 3 and Table 4.

The detailed data of the optical image capturing system of the second embodiment is as the one shown in Table 3.

TABLE 3

Lens Parameters for the Second Embodiment
f(focal length) = 1.323 mm; f/HEP = 1.8; HAF(half angle of view) = 37.5 deg; tan(HAF) = 0.7673

Surface No.		Curvature Radius	Central Thickness (mm)	Material	Refractive Index	Abbe No.	Focal Length
0	Object	Plane	At Infinity				
1	Lens 1	2.815155869	0.175	Plastic	1.515	56.55	−4.014
2		1.16843349	0.051				
3	Aperture Stop	Plane	0.066				
4	Lens 2	0.599339272	0.450	Plastic	1.544	55.96	0.837
5		−1.411016917	0.133				
6	Lens 3	−0.317760089	0.187	Plastic	1.642	22.46	5.004
7		−0.356324528	0.050				
8	Lens 4	1.400960481	0.238	Plastic	1.642	22.46	−2.390
9		0.686143826	0.219				
10	IR-bandstop filter	Plane	0.210	*BK7_ SCHOTT*	1.517	64.13	

TABLE 3-continued

Lens Parameters for the Second Embodiment f(focal length) = 1.323 mm; f/HEP = 1.8; HAF(half angle of view) = 37.5 deg; tan(HAF) = 0.7673							
Surface No.	Curvature Radius		Central Thickness (mm)	Material	Refractive Index	Abbe No.	Focal Length
11		Plane	0.31				
12	Image Plane	Plane					

Reference Wavelength = 555 nm; Shield Position: The 1st surface with clear aperture of 0.43 mm and the 5th surface with clear aperture of 0.390 mm

As for the parameters of the aspheric surfaces of the second embodiment, reference is made to Table 4.

TABLE 4

Aspheric Coefficients

Surface#	1	2	4	5
k=	−2.100896E+01	−3.117650E+01	−6.594072E−01	−5.749340E+00
A4=	−1.034815E+00	−1.247743E+00	−2.144582E+00	−5.564182E−01
A6=	−1.467293E+01	−3.933644E+01	−2.397809E+01	−5.601046E+01
A8=	4.846220E+02	1.049222E+03	1.466540E+03	7.715029E+02
A10=	−7.102825E+03	−1.234792E+04	−4.393327E+04	−8.580555E+03
A12=	5.884002E+04	5.356074E+04	7.002153E+05	6.735915E+04
A14=	−2.820526E+05	1.558329E+05	−6.248007E+06	−2.902619E+05
A16=	7.245452E+05	−2.134561E+06	2.912419E+07	5.267012E+05
A18=	−7.701193E+05	5.176547E+06	−5.535295E+07	−1.326747E+05
A20=	1.874256E+01	0.000000E+00	0.000000E+00	0.000000E+00
Surface#	6	7	8	9
k=	−1.293538E+00	−1.778968E+00	−9.958872E−02	−9.720777E+00
A4=	5.280891E+00	7.147752E+00	2.668792E+00	−6.993487E−01
A6=	−4.929357E+01	−1.152802E+02	−1.053723E+02	−9.822777E+00
A8=	−5.524670E+02	1.188148E+03	1.164018E+03	9.374187E+01
A10=	2.181848E+04	−6.205622E+03	−7.629138E+03	−4.377047E+02
A12=	−2.298819E+05	2.212051E+04	3.098893E+04	1.160682E+03
A14=	1.176507E+06	−6.949962E+04	−7.777603E+04	−1.720966E+03
A16=	−3.006163E+06	1.681686E+05	1.168351E+05	1.259258E+03
A18=	3.050941E+06	−1.906600E+05	−9.146103E+04	−3.228384E+02
A20=	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00

In the second embodiment, the presentation of the aspheric surface formula is similar to that in the first embodiment. Besides, the definitions of parameters in following tables are equal to those in the first embodiment, so the repetitious details will not be given here.

The following contents may be deduced from Table 3 and Table 4.

Second embodiment (Primary reference wavelength = 555 nm)					
InRS41	InRS42	HVT41	HVT42	ODT %	TDT %
−0.02448	−0.00545	0.30907	0.42296	1.30002	0.70606
|f/f1|	|f/f2|	|f/f3|	|f/f4|	|f1/f2|	|f2/f3|
0.32944	1.58025	0.26432	0.55346	4.79676	0.16726
ΣPPR	ΣNPR	ΣPPR/|ΣNPR|	ΣPP	ΣNP	f1/ΣPP
1.84456	0.88290	2.08922	5.84043	−6.40396	−0.68735
f4/ΣNP	IN12/f	IN23/f	IN34/f	TP3/f	TP4/f
0.37314	0.08827	0.10034	0.03781	0.14140	0.18018
InTL	HOS	HOS/HOI	InS/HOS	InTL/HOS	ΣTP/InTL
1.34974	2.08923	2.03232	0.89196	0.64605	0.77815
(TP1 + IN12)/TP2	(TP4 + IN34)/TP3	TP1/TP2	TP3/TP4	IN23/(TP2 + IN23 + TP3)	
0.64830	1.54164	0.38889	0.78476	0.17240	
|InRS41|/TP4	|InRS42|/TP4	HVT42/HOI	HVT42/HOS		
0.1027	0.0229	0.4114	0.2024		
IAG1-IAG4	OAG1-OAG4	BSL			
19 deg	19 deg	0.08 mm			
PSTA	PLTA	NSTA	NLTA	SSTA	SLTA
0.001 mm	0.001 mm	0.018 mm	0.012 mm	−0.002 mm	0.001 mm

The following contents may be deduced from Table 3 and Table 4.

Related Inflection Point Values of the Second Embodiment (Primary reference wavelength: 555 nm)							
HIF111	0.1522	HIF111/HOI	0.1481	SGI111	0.0034	| SGI111 |/(| SGI111 | + TP1)	0.0192
HIF121	0.1456	HIF121/HOI	0.1417	SGI121	0.0074	| SGI121 |/(| SGI121 | + TP1)	0.0408
HIF211	0.2328	HIF211/HOI	0.2264	SGI211	0.0389	| SGI211 |/(| SGI211 | + TP2)	0.0796
HIF311	0.2617	HIF311/HOI	0.2546	SGI311	−0.0900	| SGI311 |/(| SGI311 | + TP3)	0.3249
HIF321	0.2495	HIF321/HOI	0.2427	SGI321	−0.0673	| SGI321 |/(| SGI321 | + TP3)	0.2646
HIF411	0.1827	HIF411/HOI	0.1778	SGI411	0.0122	| SGI411 |/(| SGI411 | + TP4)	0.0486
HIF421	0.2076	HIF421/HOI	0.2020	SGI421	0.0250	| SGI421 |/(| SGI421 | + TP4)	0.0950

The relevant data of the length of outline curve may be deduced from Table 3 and Table 4.

Second embodiment (Primary reference wavelength: 555 nm)						
ARE	1/2(HEP)	ARE value	ARE-1/2(HEP)	2(ARE/HEP) %	TP	ARE/TP (%)
11	0.367	0.367	−0.00021	99.94%	0.175	209.80%
12	0.367	0.368	0.00053	100.14%	0.175	210.22%
21	0.363	0.369	0.00589	101.62%	0.450	81.92%
22	0.367	0.387	0.01919	105.22%	0.450	85.90%
31	0.367	0.398	0.03014	108.20%	0.187	212.56%
32	0.367	0.384	0.01694	104.61%	0.187	205.51%
41	0.367	0.368	0.00075	100.20%	0.238	154.48%
42	0.367	0.371	0.00333	100.91%	0.238	155.56%
ARS	EHD	ARS value	ARS-EHD	(ARS/EHD) %	TP	ARS/TP (%)
11	0.430	0.430	−0.00027	99.94%	0.175	245.56%
12	0.393	0.395	0.00137	100.35%	0.175	225.46%
21	0.363	0.369	0.00589	101.62%	0.450	81.92%
22	0.390	0.415	0.02497	106.40%	0.450	92.22%
31	0.402	0.433	0.03104	107.71%	0.187	231.77%
32	0.433	0.452	0.01854	104.28%	0.187	241.65%
41	0.503	0.519	0.01623	103.23%	0.238	217.83%
42	0.697	0.732	0.03446	104.94%	0.238	307.07%

The Third Embodiment (Embodiment 3)

Please refer to FIG. **3**A, FIG. **3**B, and FIG. **3**C. FIG. **3**A is a schematic view of the optical image capturing system according to the third embodiment of the present application, FIG. **3**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion curve of the optical image capturing system in the order from left to right according to the third embodiment of the present application, and FIG. **3**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through 0.7 view field of STA of the optical image capturing system according to the third embodiment of the present application. As shown in FIG. **3**A, in the order from an object side to an image side, the optical image capturing system includes a first lens element **310**, a second lens element **320**, an aperture stop **300**, a third lens element **330**, a fourth lens element **340**, an IR-bandstop filter **370**, an image plane **380**, and an image sensing device **390**. In the present embodiment, all of the bearing surfaces of image side and all of the bearing surfaces of object side of the lens elements are configured to extend toward the object side and intersect with the optical axis to form angles (not shown).

The first lens element **310** has positive refractive power and it is made of plastic material. The first lens element **310** has a convex object-side surface **312** and a concave image-side surface **314**, and both of the object-side surface **312** and the image-side surface **314** are aspheric and have one inflection point.

The second lens element **320** has positive refractive power and it is made of plastic material. The second lens element **320** has a convex object-side surface **322** and a convex image-side surface **324**, and both of the object-side surface **322** and the image-side surface **324** are aspheric and have one inflection point.

The third lens element **330** has positive refractive power and it is made of plastic material. The third lens element **330** has a concave object-side surface **332** and a convex image-side surface **334**, and both of the object-side surface **332** and the image-side surface **334** are aspheric and have an inflection point.

The fourth lens element **340** has negative refractive power and it is made of plastic material. The fourth lens element **340** has a convex object-side surface **342** and a concave image-side surface **344**, and both of the object-side surface **342** and the image-side surface **344** are aspheric and have an inflection point.

The IR-bandstop filter **370** is made of glass material without affecting the focal length of the optical image capturing system and it is disposed between the fourth lens element **340** and the image plane **380**.

In the optical image capturing system of the third embodiment, the first lens element, the second lens element **320** and the third lens element **330** are both positive lens elements and focal lengths thereof are f**1**, f**2** and f**3**, respectively. A sum of focal lengths of all lens elements with positive refractive power is ΣPP. The following relation is satisfied: ΣPP=f**1**+f**2**+f**3**. Hereby, it is favorable for allocating the positive refractive power of the third lens element **330** to other positive lens elements and the significant aberrations generated in the process of moving the incident light can be suppressed.

In the optical image capturing system of the second embodiment, a sum of focal lengths of all lens elements with negative refractive power is ΣNP. The following relation is satisfied: ΣNP=f**4**. Hereby, it is favorable for allocating the negative refractive power of the first lens element **310** to other negative lens elements.

Please refer to the following Table 5 and Table 6.

The detailed data of the optical image capturing system of the third embodiment is as shown in Table 5.

TABLE 5

Lens Paremeters for the Third Embodiment
f(focal length) = 1.3310 mm; f/HEP = 2.0; HAF(half angle view) = 37.5170 deg; tan(HAF) = 0.7678

Surface No.		Curvature Radius	Central Thickness (mm)	Material	Refractive Index	Abbe No.	Focal Length
0	Object	Plane	At Infinity				
1	Lens 1	0.83935305	0.175	Plastic	1.584	29.88	238.535
2		0.779262354	0.085				
3	Aperture Stop	Plane	0.050				
4	Lens 2	0.623234619	0.285	Plastic	1.545	55.96	1.089
5		−11.00170615	0.123				
6	Lens 3	−0.364938387	0.175	Plastic	1.642	22.46	10.040
7		−0.410676892	0.050				
8	Lens 4	1.0692297	0.175	Plastic	1.642	22.46	−7.515
9		0.820249597	0.138				
10	IR-bandstop Filter	Plane	0.210	*BK7_ SCHOTT*	1.517	64.13	
11		Plane	0.442				
12	Image Plane	Plane					

Reference Wavelength = 555 nm; Shield Position: The 1st surface with clear aperture of 0.370 mm and the 5th surface with clear aperture of 0.350 mm

As for the parameters of the aspheric surfaces of the third embodiment, reference is made to Table 6.

TABLE 6

Aspheric Coefficients

Surface #	1	2	4	5
k =	−1.559670E+01	−3.285895E+01	−3.283737E−01	−2.715604E+01
A4 =	2.960488E+00	5.065976E+00	−7.176660E−01	3.614461E−01
A6 =	−8.781953E+01	−1.155499E+02	−5.059534E+01	−7.045897E+01
A8 =	2.168917E+03	1.873961E+02	2.209574E+03	1.490315E+03
A10 =	−3.808808E+04	4.119672E+04	−6.239210E+04	−2.783463E+04
A12 =	4.172494E+05	−9.858251E+05	9.875788E+05	2.549608E+05
A14 =	−2.731712E+06	1.068435E+07	−9.081709E+06	−1.110874E+06
A16 =	9.752197E+06	−5.730864E+07	4.401602E+07	2.625091E+06
A18 =	−1.459442E+07	1.229646E+08	−8.582584E+07	−4.104192E+06
A20 =	1.874089E+01	0.000000E+00	0.000000E+00	0.000000E+00

Surface #	6	7	8	9
k =	−1.097425E+00	−1.384866E+00	−9.000000E+01	−1.042971E+01
A4 =	2.214305E+00	−4.780890E+00	−5.438650E+00	−5.344102E+00
A6 =	−8.731178E+01	1.414294E+02	9.066051E+01	5.295146E+01
A8 =	2.841182E+03	−1.711255E+03	−1.364068E+03	−4.481013E+02
A10 =	−5.162307E+04	9.272611E+03	1.266697E+04	2.489477E+03
A12 =	5.492447E+05	4.055356E+04	−7.011162E+04	−8.594433E+03
A14 =	−3.054910E+06	−7.073760E+05	2.041429E+05	1.680325E+04
A16 =	7.919499E+06	2.992540E+06	−2.001005E+05	−1.520673E+04
A18 =	−6.822180E+06	−4.349295E+06	−1.771508E+05	2.609779E+03
A20 =	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00

The presentation of the aspheric surface formula in the third embodiment is similar to that in the first embodiment. Besides, the definitions of parameters in following tables are equal to those in the first embodiment so the repetitious details will not be given here.

The following contents may be deduced from Table 5 and Table 6.

Third embodiment (Primary reference wavelength: 555 nm)

InRS41	InRS42	HVT41	HVT42	ODT %	TDT %
−0.06700	−0.09200	0.20300	0.29700	1.30000	0.60800
|f/f1|	|f/f2|	|f/f3|	|f/f4|	|f1/f2|	|f2/f3|
0.00558	1.22222	0.13257	0.17711	219.04040	0.10847
ΣPPR	ΣNPR	ΣPPR/|ΣNPR|	ΣPP	ΣNP	f1/ΣPP
1.36037	0.17711	7.68084	249.66400	−7.51500	0.95542
f4/ΣNP	IN12/f	IN23/f	IN34/f	TP3/f	TP4/f
−0.14491	0.10143	0.09241	0.03757	0.13148	0.13148
InTL	HOS	HOS/HOI	InS/HOS	InTL/HOS	ΣTP/InTL
1.11700	1.90700	1.85506	0.86418	0.58574	0.72516
(TP1 + IN12)/TP2	(TP4 + IN34)/TP3	TP1/TP2	TP3/TP4	IN23/(TP2 + IN23 + TP3)	
1.08772	1.28571	0.61404	1.00000	0.21098	
|InRS41|/TP4	|InRS42|/TP4	HVT42/HOI	HVT42/HOS		
0.3829	0.5257	0.2889	0.1557		
IAG1-IAG4	OAG1-OAG4	BSL			
25 deg	25 deg	0.01 mm			
PSTA	PLTA	NSTA	NLTA	SSTA	SLTA
0.002 mm	0.008 mm	0.010 mm	0.003 mm	0.004 mm	0.004 mm

The relevant data of the length of outline curve may be deduced from Table 5 and Table 6.

Related Inflection Point Values of the Third Embodiment (Primary reference wavelength: 555 nm)

HIF111	0.2660	HIF111/HOI	0.2588	SGI111	0.0370	|SGI111|/(|SGI111| + TP1)	0.1745
HIF121	0.1940	HIF121/HOI	0.1887	SGI121	0.0200	|SGI121|/(|SGI121| + TP1)	0.1026
HIF211	0.2270	HIF211/HOI	0.2208	SGI211	0.0380	|SGI211|/(|SGI211| + TP2)	0.1176
HIF221	0.3430	HIF221/HOI	0.3337	SGI221	−0.0490	|SGI221|/(|SGI221| + TP2)	0.1467
HIF311	0.2590	HIF311/HOI	0.2519	SGI311	−0.0860	|SGI311|/(|SGI311| + TP3)	0.3295
HIF321	0.2470	HIF321/HOI	0.2403	SGI321	−0.0730	|SGI321|/(|SGI321| + TP3)	0.2944
HIF411	0.0950	HIF411/HOI	0.0924	SGI411	0.0030	|SGI411|/(|SGI411| + TP4)	0.0169
HIF421	0.1440	HIF421/HOI	0.1401	SGI421	0.0100	|SGI421|/(|SGI421| + TP4)	0.0541

The relevant data of the length of outline curve may be deduced from Table 5 and Table 6.

Third embodiment (Primary reference wavelength: 555 nm)

ARE	1/2(HEP)	ARE value	ARE-1/2(HEP)	2(ARE/HEP) %	TP	ARE/TP (%)
11	0.333	0.337	0.00406	101.22%	0.175	192.42%
12	0.333	0.334	0.00166	100.50%	0.175	191.05%
21	0.329	0.335	0.00624	101.90%	0.285	117.73%
22	0.333	0.339	0.00628	101.89%	0.285	119.01%
31	0.333	0.358	0.02516	107.56%	0.175	204.48%
32	0.333	0.353	0.02042	106.14%	0.175	201.77%
41	0.333	0.333	0.00028	100.08%	0.175	190.26%
42	0.333	0.333	0.00021	100.06%	0.175	190.22%
ARS	EHD	ARS value	ARS-EHD	(ARS/EHD) %	TP	ARS/TP (%)
11	0.370	0.374	0.004	101.14%	0.175	213.83%
12	0.335	0.337	0.002	100.66%	0.175	192.77%
21	0.329	0.335	0.006	101.90%	0.285	117.73%
22	0.350	0.358	0.008	102.36%	0.285	125.79%
31	0.366	0.392	0.026	107.17%	0.175	224.16%
32	0.401	0.423	0.022	105.49%	0.175	241.46%
41	0.463	0.488	0.026	105.55%	0.175	278.99%
42	0.601	0.660	0.060	109.93%	0.175	377.37%

The Fourth Embodiment (Embodiment 4)

Please refer to FIG. **4**A, FIG. **4**B, and FIG. **4**C. FIG. **4**A is a schematic view of the optical image capturing system according to the fourth embodiment of the present application, FIG. **4**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion curve of the optical image capturing system in the order from left to right according to the fourth embodiment of the present application, and FIG. **4**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through 0.7 view field of STA of the optical image capturing system according to the fourth embodiment of the present application. As shown in FIG. **4**A, in order from an object side to an image side, the optical image capturing system includes first lens element **410**, an aperture stop **400**, a second lens element **420**, a third lens element **430**, a fourth lens element **440**, an IR-bandstop filter **470**, an image plane **480**, and an image sensing device **490**. In the present embodiment, all of the bearing surfaces of image side and all of the bearing surfaces of object side of the lens elements are configured to extend toward the object side and intersect with the optical axis to form angles (not shown).

The first lens element **410** has positive refractive power and it is made of plastic material. The first lens element **410** has a convex object-side surface **412** and a concave image-side surface **414**, and both of the object-side surface **412** and the image-side surface **414** are aspheric and have one inflection point.

The second lens element **420** has positive refractive power and it is made of plastic material. The second lens element **420** has a convex object-side surface **422** and a convex image-side surface **424**, and both of the object-side surface **422** and the image-side surface **424** are aspheric. The object-side surface **422** has one inflection point.

The third lens element **430** has negative refractive power and it is made of plastic material. The third lens element **430** has a concave object-side surface **432** and a convex image-side surface **434**, and both of the object-side surface **432** and the image-side surface **434** are aspheric and have an inflection point.

The fourth lens element **440** has positive refractive power and it is made of plastic material. The fourth lens element **440** has a concave object-side surface **442** and a convex image-side surface **444**, and both of the object-side surface **442** and the image-side surface **444** are aspheric and have one inflection point.

The IR-bandstop filter **470** is made of glass material without affecting the focal length of the optical image capturing system and it is disposed between the fourth lens element **440** and the image plane **480**.

In the optical image capturing system of the fourth embodiment, the first lens element **410**, the second lens element **420** and the fourth lens element **440** are both positive lens elements and focal lengths thereof are f**1**, f**2** and f**4**, respectively. A sum of focal lengths of all lens elements with positive refractive power is ΣPP. The following relation is satisfied: ΣPP=f**1**+f**2**+f**4**. Hereby, it is favorable for allocating the positive refractive power of the third lens element **440** to other positive lens elements and the significant aberrations generated in the process of moving the incident light can be suppressed.

In the optical image capturing system of the fourth embodiment, a sum of focal length of the third lens elements with negative refractive power is ΣNP. The following relation is satisfied: ΣNP=f**3**. Hereby, it is favorable for allocating the negative refractive power of the first lens element **430** to other negative lens elements.

Please refer to the following Table 7 and Table 8.

The detailed data of the optical image capturing system of the fourth embodiment is as shown in Table 7.

TABLE 7

Lens Parameters of the Fourth Embodiment
f = 1.3290 mm; f/HEP = 2.0; HAF = 37.5150 deg; tan(HAF) = 0.7677

Surface #		Curvature Radius	Thickness (mm)	Material	Refractive Index	Abbe #	Focal length
0	Object	Plano	At infinity				
1	Lens 1	0.796358327	0.175	Plastic	1.584	29.88	47.93
2		0.752894203	0.095				
3	Ape. Stop	Plano	0.050				
4	Lens 2	0.69002414	0.289	Plastic	1.545	55.96	1.14
5		−5.470145447	0.127				
6	Lens 3	−0.375226684	0.175	Plastic	1.642	22.46	−7.54
7		−0.480949837	0.050				
8	Lens 4	0.634776701	0.175	Plastic	1.642	22.46	9.92
9		0.628050498	0.130				
10	IR-band stop filter	Plano	0.210	BK7_ SCHOTT	1.517	64.13	
11		Plano	0.446				
12	Image plane	Plano					

Reference wavelength = 555 nm, shield position: first surface with clear aperture of 0.390 mm, and the fifth surface with clear aperture (CA) of 0.350 mm

As for the parameters of the aspheric surfaces of the fourth embodiment, reference is made to Table 8.

TABLE 8

Aspheric Coefficients

Surface#	1	2	4	5
k =	−1.559070E+01	−3.277696E+01	−1.338964E−01	−2.644155E+01
A4 =	3.931058E+00	6.407587E+00	−7.455663E−01	−3.112638E−01
A6 =	−1.040453E+02	−1.208225E+02	−4.905075E+01	−7.316173E+01
A8 =	2.548788E+03	−4.252993E+01	2.152711E+03	1.536768E+03
A10 =	−4.367449E+04	4.938506E+04	−6.180943E+04	−3.005936E+04
A12 =	4.647813E+05	−1.098966E+06	9.823348E+05	3.189116E+05
A14 =	−2.944070E+06	1.140707E+07	−9.044375E+06	−1.714189E+06
A16 =	1.013712E+07	−5.908647E+07	4.382259E+07	4.420446E+06
A18 =	−1.459442E+07	1.229646E+08	−8.582584E+07	−4.104192E+06
A20 =	1.874407E+01	0.000000E+00	0.000000E+00	0.000000E+00

Surface#	6	7	8	9
k =	−9.444825E−01	−8.569895E−01	−2.727253E+01	−1.028315E+01
A4 =	1.474769E+00	−7.584700E+00	−4.999799E+00	−3.743632E+00
A6 =	−2.913984E+01	2.026719E+02	6.751631E+01	2.859772E+01
A8 =	1.861605E+02	−2.697091E+03	−9.280684E+02	−2.281186E+02
A10 =	−1.107176E+03	1.921504E+04	7.954824E+03	1.278101E+03
A12 =	8.405416E+04	−1.663989E+04	−3.875688E+04	−4.522034E+03

TABLE 8-continued

Aspheric Coefficients				
A14 =	−9.804138E+05	−5.393357E+05	8.940373E+04	9.165264E+03
A16 =	4.316120E+06	2.803448E+06	−2.453740E+04	−9.062636E+03
A18 =	−6.822180E+06	−4.349295E+06	−1.771508E+05	2.609779E+03
A20 =	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00

The presentation of the aspheric surface formula in the fourth embodiment is similar to that in the first embodiment. Besides the definitions of parameters in following tables are equal to those in the first embodiment so the repetitious details will not be given here.

The following contents may be deduced from Table 7 and Table 8.

-continued

Fourth Embodiment (Primary Reference Wavelength 555 nm)						
32	0.332	0.353	0.02089	106.28%	0.175	201.85%
41	0.332	0.333	0.00065	100.20%	0.175	190.29%

Fourth Embodiment (Primary reference wavelength: 555 nm)					
InRS41	InRS42	HVT41	HVT42	ODT %	TDT %
−0.04300	−0.06200	0.26100	0.34000	1.30500	0.49200
|f/f1|	|f/f2|	|f/f3|	|f/f4|	|f1/f2|	|f2/f3|
0.02773	1.16477	0.17617	0.13399	42.00876	0.15125
ΣPPR	ΣNPR	ΣPPR/|ΣNPR|	ΣPP	ΣNP	f1/ΣPP
1.32648	0.17617	7.52969	58.99200	−7.54400	0.81252
f4/ΣNP	IN12/f	IN23/f	IN34/f	TP3/f	TP4/f
−0.15125	0.10910	0.09556	0.03762	0.13168	0.13168
InTL	HOS	HOS/HOI	InS/HOS	InTL/HOS	ΣTP/InTL
1.13600	1.92300	1.87062	0.85959	0.59074	0.71655
(TP1 + IN12)/TP2	(TP4 + IN34)/TP3	TP1/TP2	TP3/TP4	IN23/(TP2 + IN23 + TP3)	
1.10727	1.28571	0.60554	1.00000	0.21489	
|InRS41|/TP4	|InRS42|/TP4	HVT42/HOI	HVT42/HOS		
0.2457	0.3543	0.3307	0.1768		
IAG1-IAG4	OAG1-OAG4	BSL			
25 deg	25 deg	0.01 mm			
PSTA	PLTA	NSTA	NLTA	SSTA	SLTA
0.00007 mm	0.004 mm	0.008 mm	−0.00001 mm	0.005 mm	0.005 mm

The following contents may be deduced from Table 7 and Table 8.

Related Inflection Point Values of the Fourth Embodiment (Primary reference wavelength: 555 nm)							
HIF111	0.3010	HIF111/HOI	0.2928	SGI111	0.0510	| SGI111 |/(| SGI111 | + TP1)	0.2257
HIF121	0.2200	HIF121/HOI	0.2140	SGI121	0.0280	| SGI121 |/(| SGI121 | + TP1)	0.1379
HIF211	0.2190	HIF211/HOI	0.2130	SGI211	0.0320	| SGI211 |/(| SGI211 | + TP2)	0.0997
HIF311	0.2600	HIF311/HOI	0.2529	SGI311	−0.0870	| SGI311 |/(| SGI311 | + TP3)	0.3321
HIF321	0.2570	HIF321/HOI	0.2500	SGI321	−0.0750	| SGI321 |/(| SGI321 | + TP3)	0.3000
HIF411	0.1210	HIF411/HOI	0.1177	SGI411	0.0090	| SGI411 |/(| SGI411 | + TP4)	0.0489
HIF421	0.1620	HIF421/HOI	0.1576	SGI421	0.0160	| SGI421 |/(| SGI421 | + TP4)	0.0838

The relevant data of the length of outline curve may be deduced from Table 7 and Table 8.

Fourth Embodiment (Primary Reference Wavelength 555 nm)						
ARE	1/2(HEP)	ARE value	ARE-1/2(HEP)	2(ARE/HEP) %	TP	ARE/TP (%)
11	0.332	0.339	0.00620	101.87%	0.175	193.46%
12	0.332	0.336	0.00327	100.98%	0.175	191.78%
21	0.321	0.326	0.00425	101.32%	0.289	112.60%
22	0.332	0.342	0.00955	102.87%	0.289	118.23%
31	0.332	0.360	0.02753	108.28%	0.175	205.65%

-continued

Fourth Embodiment (Primary Reference Wavelength 555 nm)						
42	0.332	0.334	0.00172	100.52%	0.175	190.90%
ARS	EHD	ARS value	ARS-EHD	(ARS/EHD) %	TP	ARS/TP (%)
11	0.390	0.397	0.007	101,82%	0.175	226.92%
12	0.338	0.341	0.003	100.82%	0.175	194.64%
21	0.321	0.326	0.004	101.32%	0.289	112.60%
22	0.350	0.362	0.012	103.55%	0.289	125.32%
31	0.368	0.397	0.029	107.80%	0.175	226.72%

-continued

Fourth Embodiment (Primary Reference Wavelength 555 nm)						
32	0.407	0,429	0.022	105.43%	0.175	244.96%
41	0.486	0.511	0.025	105.08%	0.175	291.94%
42	0.625	0.683	0.057	109.17%	0.175	390.18%

The Fifth Embodiment (Embodiment 5)

Please refer to FIG. **5**A, FIG. **5**B, and FIG. **5**C. FIG. **5**A is a schematic view of the optical image capturing system according to the fifths embodiment of the present application, FIG. **5**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion curve of the optical image capturing system in the order from left to right according to the fifth embodiment of the present application, and FIG. **5**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through 0.7 view field of STA of the optical image capturing system according to the fifth embodiment of the present application. As shown in FIG. **5**A, in order from an object side to an image side, the optical image capturing system includes a first lens element **510**, an aperture stop **500**, a second lens element **520**, a third lens element **530**, a fourth lens element **540**, an IR-bandstop filter **570**, an image plane **580**, and an image sensing device **590**. In the present embodiment, all of the bearing surfaces of image side and all of the bearing surfaces of object side of the lens elements are configured to extend toward the object side and intersect with the optical axis to form angles (not shown).

The first lens element **510** has positive refractive power and it is made of plastic material. The first lens element **510** has a convex object-side surface **512** and a concave image-side surface **514**, and both of the object-side surface **512** and the image-side surface **514** are aspheric and have one inflection.

The second lens element **520** has positive refractive power and it is made of plastic material. The second lens element **520** has a convex object-side surface **522** and a convex image-side surface **524**, and both of the object-side surface **522** and the image-side surface **524** are aspheric. The object-side surface **522** has one inflection point.

The third lens element **530** has positive refractive power and it is made of plastic material. The third lens element **530** has a concave object-side surface **532** and a convex image-side surface **534**, and both of the object-side surface **532** and the image-side surface **534** are aspheric and have an inflection point.

The fourth lens element **540** has negative refractive power and it is made of plastic material. The fourth lens element **540** has a convex object-side surface **542** and a concave image-side surface **544**, and both of the object-side surface **542** and the image-side surface **544** are aspheric and have an inflection point.

The IR-bandstop filter **570** is made of glass material without affecting the focal length of the optical image capturing system and it is disposed between the fourth lens element **540** and the image plane **580**.

In the optical image capturing system of the fifth embodiment, focal lengths of the first lens element **510**, the second lens element **520**, and the third lens element **530** are f**1**, f**2**, and f**3**, respectively. A sum of focal lengths of all lens elements with positive refractive power is ΣPP. The following relation is satisfied: ΣPP=f**1**+f**2**+f**3**. Hereby, it is favorable for allocating the positive refractive power of the fourth lens element **540** to other positive lens elements and the significant aberrations generated in the process of moving the incident light can be suppressed.

In the optical image capturing system of the fifth embodiment, a sum of focal lengths of all lens elements with negative refractive power is ΣNP. The following relation is satisfied: ΣNP=44. Hereby, it is favorable for allocating the negative refractive power of the first lens element **510** to other negative lens elements.

Please refer to the following Table 9 and Table 10.

The detailed data of the optical image capturing system of the fifth embodiment is as shown in Table 9.

TABLE 9

Lens Parameters of the Fifth Embodiment
f = 1.3290 mm; f/HEP = 2.0; HAF = 37.5120 deg; tan(HAF) = 0.7677

Surface#		Curvature Radius	Thickness (mm)	Material	Refractive Index	Abbe #	Focal length
0	Object	Plano	At infinity				
1	Lens 1	0.764838324	0.175	Plastic	1.584	29.88	32.549
2		0.729251375	0.105				
3	Ape. Stop	Plano	0.050				
4	Lens 2	0.770395463	0.297	Plastic	1.545	55.96	1.164
5		−3.142770862	0.142				
6	Lens 3	−0.364018853	0.175	Plastic	1.642	22.46	10.785
7		−0.411367225	0.050				
8	Lens 4	0.704534047	0.175	Plastic	1.642	22.46	−8.882
9		0.566378176	0.133				
10	IR-bandstop filter	Plano	0.210	BK_7	1.517	64.13	
11		Plano	0.426				
12	Image plane	Plano	0.000				

Reference wavelength = 555 nm; shielding position = The 1st surface with clear aperture of 0.400 mm and the 5th surface with clear aperture of 0.350 mm

As for the parameters of the aspheric surfaces of the fifth embodiment, reference is made to Table 10.

TABLE 10

Aspheric Coefficients				
Surface #	1	2	4	5
k =	−1.556135E+01	−3.280664E+01	−3.827055E−01	−2.644155E+01
A4 =	4.702703E+00	7.815202E+00	−7.484692E−01	−1.194821E+00
A6 =	−1.160799E+02	−1.393947E+02	−3.722463E+01	−5.746811E+01
A8 =	2.832783E+03	2.293905E+02	1.632621E+03	1.097333E+03
A10 =	−4.795248E+04	4.713187E+04	−5.067966E+04	−2.273134E+04
A12 =	5.017520E+05	−1.090364E+06	8.450075E+05	2.609284E+05
A14 =	−3.109684E+06	1.139193E+07	−8.139072E+06	−1.526369E+06
A16 =	1.043435E+07	−5.906522E+07	4.116555E+07	4.236962E+06
A18 =	−1.459442E+07	1.229646E+08	−8.582584E+07	−4.104192E+06
A20 =	1.874596E+01	0.000000E+00	0.000000E+00	0.000000E+00
Surface #	6	7	8	9
k =	−9.330802E−01	−1.025218E+00	−3.602467E+01	−1.030472E+01
A4 =	2.840791E−01	−4.611834E+00	−2.350703E+00	−2.912683E+00
A6 =	2.103726E+01	1.376837E+02	1.381331E+01	1.830157E+01
A8 =	−1.663331E+03	−1.900876E+03	−2.230149E+02	−1.401876E+02
A10 =	3.161881E+04	1.231873E+04	1.983758E+03	7.950709E+02
A12 =	−2.054994E+05	2.342849E+04	−7.402581E+03	−2.878355E+03
A14 =	2.733846E+05	−6.727018E+05	−2.462934E+03	6.062118E+03
A16 =	2.190178E+06	2.990921E+06	9.002743E+04	−6.575243E+03
A18 =	−6.822180E+06	−4.349295E+06	−1.771508E+05	2.609779E+03
A20 =	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00

The presentation of the aspheric surface formula in the fifth embodiment is similar to that in the first embodiment. Besides the definitions of parameters in following tables areequal to those in the first embodiment so the repetitious details will not be given here.

The following contents may be deduced from Table 9 and Table 10.

Fifth embodiment (Primary reference wavelength: 555 nm)					
InRS41	InRS42	HVT41	HVT42	ODT %	TDT %
−0.04100	−0.04600	0.27400	0.36500	1.30000	0.44600
|f/f1|	|f/f2|	|f/f3|	|f/f4|	|f1/f2|	|f2/f3|
0.04083	1.14175	0.12323	0.14963	27.96306	0.10793
ΣPPR	ΣNPR	ΣPPR/|ΣNPR|	ΣPP	ΣNP	f1/ΣPP
1.30581	0.14963	8.72702	44.49800	−8.88200	0.73147
f4/ΣNP	IN12/f	IN23/f	IN34/f	TP3/f	TP4/f
1.00000	0.11663	0.10685	0.03762	0.13168	0.13168
InTL	HOS	HOS/HOI	InS/HOS	InTL/HOS	ΣTP/InTL
1.16800	1.93700	1.88424	0.85545	0.60299	0.70377
(TP1 + IN12)/TP2	(TP4 + IN34)/TP3	TP1/TP2	TP3/TP4	IN23/(TP2 + IN23 + TP3)	
1.11111	1.28571	0.58923	1.00000	0.23127	
|InRS41|/TP4	|InRS42|/TP4	HVT42/HOI	HVT42/HOS		
0.2343	0.2629	0.3551	0.1884		
IAG1-IAG4	OAG1-OAG4	BSL			
25 deg	25 deg	0.01 mm			
PSTA	PLTA	NSTA	NLTA	SSTA	SLTA
0.00019 mm	0.001 mm	−0.007 mm	−0.016 mm	0.003 mm	0.005 mm

The following contents may be deduced from Table 9 and Table 10.

Related inflection point values of fifth embodiment (Primary reference wavelength: 555 nm)							
HIF111	0.3250	HIF111/HOI	0.3161	SGI111	0.0640	| SGI111 |/(| SGI111 | + TP1)	0.2678
HIF121	0.2410	HIF121/HOI	0.2344	SGI121	0.0350	| SGI121 |/(| SGI121 | + TP1)	0.1667
HIF211	0.2080	HIF211/HOI	0.2023	SGI211	0.0260	| SGI211 |/(| SGI211 | + TP2)	0.0805
HIF311	0.2620	HIF311/HOI	0.2549	SGI311	−0.0950	| SGI311 |/(| SGI311 | + TP3)	0.3519
HIF321	0.2640	HIF321/HOI	0.2568	SGI321	−0.0860	| SGI321 |/(| SGI321 | + TP3)	0.3295

-continued

Related inflection point values of fifth embodiment (Primary reference wavelength: 555 nm)							
HIF411	0.1330	HIF411/HOI	0.1294	SGI411	0.0090	| SGI411 |/(| SGI411 | + TP4)	0.0489
HIF421	0.1710	HIF421/HOI	0.1663	SGI421	0.0200	| SGI421 |/(| SGI421 | + TP4)	0.1026

The relevant data of the length of outline curve may be deduced from Table 9 and Table 10.

Fifth embodiment (Primary reference wavelength: 555 nm)						
ARE	1/2(HEP)	ARE value	ARE-1/2(HEP)	2(ARE/HEP) %	TP	ARE/TP (%)
11	0.332	0.340	0.00801	102.41%	0.175	194.44%
12	0.332	0.337	0.00497	101.50%	0.175	192.70%
21	0.317	0.319	0.00257	100.81%	0.297	107.74%
22	0.332	0.346	0.01356	104.08%	0.297	116.63%
31	0.332	0.365	0.03253	109.79%	0.175	208.45%
32	0.332	0.358	0.02594	107.81%	0.175	204.68%
41	0.332	0.333	0.00066	100.20%	0.175	190.23%
42	0.332	0.335	0.00265	100.80%	0.175	191.37%
ARS	EHD	ARS value	ARS-EHD	(ARS/EHD) %	TP	ARS/TP (%)
11	0.400	0.410	0.010	102.60%	0.175	234.51%
12	0.338	0.343	0.005	101.46%	0.175	196.15%
21	0.317	0.319	0.003	100.81%	0.297	107.74%
22	0.350	0.368	0.018	105.17%	0.297	124.15%
31	0.370	0.405	0.034	109.26%	0.175	231.15%
32	0.412	0.439	0.027	106.62%	0.175	250.85%
41	0.503	0.528	0.025	105.06%	0,175	301.99%
42	0.650	0.707	0.057	108.80%	0,175	404.26%

The Sixth Embodiment (Embodiment 6)

Please refer to FIG. **6**A, FIG. **6**B, and FIG. **6**C. FIG. **6**A is a schematic view of the optical image capturing system according to the sixth embodiment of the present application, FIG. **6**B is longitudinal spherical aberration curves, astigmatic field curves, and an optical distortion curve of the optical image capturing system in the order from left to right according to the sixth embodiment of the present application, and FIG. **6**C is a lateral aberration diagram of tangential fan, sagittal fan, the longest operation wavelength and the shortest operation wavelength passing through 0.7 view field of STA of the optical image capturing system according to the sixth embodiment of the present application. As shown in FIG. **6**A, in order from an object side to an image side, the optical image capturing system includes a first lens element **610**, an aperture stop **600**, a second lens element **620**, a third lens element **630**, a fourth lens element **640**, an IR-bandstop filter **670**, an image plane **680**, and an image sensing device **690**. In the present embodiment, all of the bearing surfaces of image side and all of the bearing surfaces of object side of the lens elements are configured to extend toward the object side and intersect with the optical axis to form angles (not shown).

The first lens element **610** has positive refractive power and it is made of plastic material. The first lens element **610** has a convex object-side surface **612** and a concave image-side surface **614**, and both of the object-side surface **612** and the image-side surface **614** are aspheric and have one inflection.

The second lens element **620** has positive refractive power and it is made of plastic material. The second lens element **620** has a convex object-side surface **622** and a convex image-side surface **624**, and both of the object-side surface **622** and the image-side surface **624** are aspheric and have one inflection.

The third lens element **630** has positive refractive power and it is made of plastic material. The third lens element **630** has a concave object-side surface **632** and a convex image-side surface **634**, and both of the object-side surface **632** and the image-side surface **634** are aspheric. The object-side surface **632** has an inflection point.

The fourth lens element **640** has negative refractive power and it is made of plastic material. The fourth lens element **640** has a convex object-side surface **642** and a convex image-side surface **644**, and both of the object-side surface **642** and the image-side surface **644** are aspheric. The object-side surface **642** has an inflection point.

The IR-bandstop filter **670** is made of glass material without affecting the focal length of the optical image capturing system and it is disposed between the fourth lens element **640** and the image plane **680**.

In the optical image capturing system of the fifth embodiment, the first lens element **610**, the second lens element **620**, and the third lens element **630** are all positive lens elements, and focal lengths thereof are f**1**, f**2**, and f**3**, respectively. A sum of focal lengths of all lens elements with positive refractive power is ΣPP. The following relation is satisfied: ΣPP=f**1**+f**2**+f**3**. Hereby, it is favorable for allocating the positive refractive power to other positive lens elements and the significant aberrations generated in the process of moving the incident light can be suppressed.

In the optical image capturing system of the fifth embodiment, a sum of focal lengths of all lens elements with negative refractive power is ΣNP. The following relation is satisfied: ΣNP=f**4**. Hereby, it is favorable for allocating the negative refractive power to other negative lens elements.

Please refer to the following Table 11 and Table 12.

The detailed data of the optical image capturing system of the sixth embodiment is as shown in Table 11.

TABLE 11

Data of the optical image capturing system f = 1.3290 mm; f/HEP = 2.0; HAF = 37.5120 deg; tan(HAF) = 0.7677							
Surface #	Curvature Radius		Thickness (mm)	Material	Refractive Index	Abbe #	Focal length
0	Object	Plano	At infinity				

TABLE 11-continued

Data of the optical image capturing system f = 1.3290 mm; f/HEP = 2.0; HAF = 37.5120 deg; tan(HAF) = 0.7677							
Surface #		Curvature Radius	Thickness (mm)	Material	Refractive Index	Abbe #	Focal length
1	Lens 1	0.852727177	0.175	Plastic	1.584	29.88	27.43
2		0.831996164	0.091				
3	Ape. Stop	Plano	0.054				
4	Lens 2	0.761891411	0.289	Plastic	1.545	55.96	1.19
5		−3.904738276	0.165				
6	Lens 3	−0.361643479	0.175	Plastic	1.642	22.46	3.29
7		−0.367957202	0.050				
8	Lens 4	0.829526508	0.175	Plastic	1.642	22.46	−3.09
9		0.537691373	0.133				
10	IR-bandstop filter	Plano	0.210	BK_7	1.517	64.13	
11		Plano	0.403				
12	Image plane	Plano					

Reference wavelength = 555 nm; shield position: the first surface with clear aperture of 0.410 mm; the fifth surface with clear aperture (CA) of 0.390 mm.

As for the parameters of the aspheric surfaces of the sixth embodiment, reference is made to Table 12.

TABLE 12

Aspheric Coefficients				
Surface #	1	2	4	5
k =	−1.557647E+01	−3.277776E+01	−2.789439E−01	−2.836680E+01
A4 =	3.496099E+00	4.070620E+00	−1.045470E+00	−1.071473E+00
A6 =	−1.127991E+02	−3.227539E+01	−2.564283E+01	−5.128397E+01
A8 =	3.028273E+03	−2.350251E+03	1.176839E+03	1.010546E+03
A10 =	−5.234801E+04	8.785110E+04	−3.996886E+04	−2.036338E+04
A12 =	5.430169E+05	−1.475501E+06	7.157242E+05	2.273671E+05
A14 =	−3.294190E+06	1.338238E+07	−7.321641E+06	−1.326611E+06
A16 =	1.075724E+07	−6.336433E+07	3.923895E+07	3.816418E+06
A18 =	−1.459442E+07	1.229646E+08	−8.582584E+07	−4.104192E+06
A20 =	1.874288E+01	0.000000E+00	0.000000E+00	0.000000E+00
Surface #	6	7	8	9
k =	−8.227774E−01	−1.160439E+00	−5.134444E+01	−1.033455E+01
A4 =	−7.042761E−02	−1.595838E+00	−4.577708E−01	−2.412686E+00
A6 =	4.173408E+01	5.861257E+01	−1.934862E+01	1.478557E+01
A8 =	−2.176985E+03	−6.395381E+02	1.955137E+02	−1.211551E+02
A10 =	3.762443E+04	−1.481922E+03	−1.529580E+03	7.099192E+02
A12 =	−2.413331E+05	1.134396E+05	1.081871E+04	−2.582762E+03
A14 =	3.738232E+05	−9.795245E+05	−5.450324E+04	5.449786E+03
A16 =	2.097561E+06	3.407940E+06	1.527241E+05	−6.031428E+03
A18 =	−6.822180E+06	−4.349295E+06	−1.771508E+05	2.609779E+03
A20 =	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00

In the sixth embodiment, the presentation of the aspheric surface formula is similar to that in the first embodiment. Besides, the definitions of parameters in following tables are equal to those in the first embodiment, so the repetitious details will not be given here.

The following contents may be deduced from Table 11 and Table 12.

Sixth embodiment (Primary reference wavelength: 555 nm)					
InRS41	InRS42	HVT41	HVT42	ODT %	TDT %
−0.04000	−0.03700	0.28600	0.38800	1.30600	0.56600
|f/f1|	|f/f2|	|f/f3|	|f/f4|	|f1/f2|	|f2/f3|
0.04845	1.11400	0.40407	0.43038	22.99413	0.36272
ΣPPR	ΣNPR	ΣPPR/|ΣNPR|	ΣPP	ΣNP	f1/ΣPP
1.56652	0.43038	3.63989	31.91400	−3.08800	0.85956

-continued

Sixth embodiment (Primary reference wavelength: 555 nm)					
f4/ΣNP	IN12/f	IN23/f	IN34/f	TP3/f	TP4/f
1.00000	0.10910	0.12415	0.03762	0.13168	0.13168
InTL	HOS	HOS/HOI	InS/HOS	InTL/HOS	ΣTP/InTL
1.17400	1.92100	1.86868	0.86101	0.61114	0.69336
(TP1 + IN12)/TP2	(TP4 + IN34)/TP3	TP1/TP2	TP3/TP4	IN23/(TP2 + IN23 + TP3)	
1.10727	1.28571	0.60554	1.00000	0.26232	
|InRS41|/TP4	|InRS42|/TP4	HVT42/HOI	HVT42/HOS		
0.2286	0.2114	0.3774	0.2020		
IAG1-IAG4	OAG1-OAG4	BSL			
25 deg	25 deg	0.01 mm			
PSTA	PLTA	NSTA	NLTA	SSTA	SLTA
0.001 mm	0.00022 mm	−0.001 mm	−0.009 mm	0.002 mm	0.004 mm

The following contents may be deduced from Table 11 and Table 12.

Related inflection point values of Sixth Embodiment (Primary reference wavelength: 555 nm)							
HIF111	0.3020	HIF111/HOI	0.2938	SGI111	0.0470	| SGI111 |/(| SGI111 | + TP1)	0.2117
HIF121	0.2210	HIF121/HOI	0.2150	SGI121	0.0250	| SGI121 |/(| SGI121 | + TP1)	0.1250
HIF211	0.2120	HIF211/HOI	0.2062	SGI211	0.0270	| SGI211 |/(| SGI211 | + TP2)	0.0854
HIF311	0.2670	HIF311/HOI	0.2597	SGI311	−0.1010	| SGI311 |/(| SGI311 | + TP3)	0.3659
HIF321	0.2720	HIF321/HOI	0.2646	SGI321	−0.0960	| SGI321 |/(| SGI321 | + TP3)	0.3542
HIF411	0.1460	HIF411/HOI	0.1420	SGI411	0.0090	| SGI411 |/(| SGI411 | + TP4)	0.0489
HIF421	0.1790	HIF421/HOI	0.1741	SGI421	0.0230	| SGI421 |/(| SGI421 | + TP4)	0.1162

The relevant data of the length of outline curve may be deduced from Table 11 and Table 12.

Sixth Embodiment (Primary reference wavelength: 555 nm)						
ARE	1/2(HEP)	ARE value	ARE-1/2(HEP)	2(ARE/HEP) %	TP	ARE/TP (%)
11	0.332	0.338	0.00532	101.60%	0.175	192.91%
12	0.332	0.335	0.00270	100.81%	0.175	191.41%
21	0.322	0.325	0.00308	100.96%	0.289	112.53%
22	0.332	0.343	0.01059	103.19%	0.289	118.54%
31	0.332	0.368	0.03559	110.71%	0.175	210.20%
32	0.332	0.362	0.02988	108,99%	0.175	206.94%
41	0.332	0,333	0.00051	100.15%	0.175	190.16%
42	0.332	0.336	0.00328	100.99%	0.175	191.74%
ARS	EHD	ARS value	ARS-EHD	(ARS/EHD) %	TP	ARS/TP (%)
11	0.410	0.416	0.006	101.51%	0.175	237.82%
12	0.348	0,351	0.003	100.80%	0.175	200.56%
21	0.322	0,325	0.003	100.96%	0.289	112.53%
22	0.350	0,364	0.014	104,06%	0.289	125.92%
31	0.372	0.410	0.038	110.26%	0.175	234.11%
32	0.420	0.453	0.033	107.79%	0.175	258,71%
41	0.523	0.546	0.024	104.52%	0.175	312.24%
42	0.675	0.734	0.059	108.81%	0.175	419.71%

Although the present invention is disclosed by the aforementioned embodiments, those embodiments do not serve to limit the scope of the present invention. A person skilled in the art could perform various alterations and modifications to the present invention, without departing from the spirit and the scope of the present invention. Hence, the scope of the present invention should be defined by the following appended claims.

Despite the fact that the present invention is specifically presented and illustrated with reference to the exemplary embodiments thereof, it should be apparent to a person skilled in the art that, various modifications could be performed to the forms and details of the present invention, without departing from the scope and spirit of the present invention defined in the claims and their equivalence.

What is claimed is:

1. An optical image capturing system, from an object side to an image side, comprising:

a first lens element with refractive power and having a first bearing surface of image side on an image-side surface thereof;

a second lens element with refractive power and having a second bearing surface of object side on an object-side surface thereof and a second bearing surface of image side on an image-side surface thereof; and the second bearing surface of object side contacting with the first bearing surface of image side;

a third lens element with refractive power;

a fourth lens element with refractive power; and

an image plane;

wherein the optical image capturing system comprises the four lens elements with refractive powers, a maximum height for image formation on the image plane perpendicular to the optical axis in the optical image capturing system is denoted by HOI, at least one of the first through fourth lens elements has positive refractive power, focal lengths of the first through fourth lens elements are **f1**, **f2**, **f3** and **f4** respectively, a focal length of the optical image capturing system is f, an entrance pupil diameter of the optical image capturing system is HEP, a distance on an optical axis from an object-side surface of the first lens element to the image plane is HOS, a distance on an optical axis from the object-side surface of the first lens element to the image-side surface of the fourth lens element is InTL, half of a maximum view angle of the optical image capturing system is HAF, a length of outline curve from an axial point on any surface of any one of the four lens elements to a coordinate point of vertical height with a distance of a half of the entrance pupil diameter from the optical axis on the surface along an outline of the surface is denoted as ARE, and the following conditions are satisfied: 1.0≤f/HEP≤10.0; 0 deg<HAF≤150 deg and 0.9≤2(ARE/HEP)≤2.0.

2. The optical image capturing system of claim **1**, wherein the third lens element has a third bearing surface of object side on the object-side surface thereof and a third bearing surface of image side on the image-side surface thereof; and the third bearing surface of object side contacts with the second bearing surface of image side.

3. The optical image capturing system of claim **2**, wherein the fourth lens element has a fourth bearing surface of object side on the object-side surface thereof and a fourth bearing surface of image side on the image-side surface thereof; and the fourth bearing surface of object side contacts with the third bearing surface of image side.

4. The optical image capturing system of claim **2**, wherein extension lines of the first bearing surface of image side to the third bearing surface of image side intersect with the optical axis to form angles IAG, which are denoted as IAG**1**, IAG**2**, IAG**3** respectively, and the following conditions are satisfied: 0 deg<IAG≤90 deg.

5. The optical image capturing system of claim **4**, wherein IAG**1**, IAG**2**, IAG**3** satisfy with the following condition: IAG1=IAG2=IAG**3**.

6. The optical image capturing system of claim **2**, wherein extension lines of the second bearing surface of object side to the third bearing surface of object side intersect with the optical axis to form angles OAG, which are denoted as OAG**2** and OAG**3** respectively, and the following conditions are satisfied: 0 deg<OAG≤90 deg.

7. The optical image capturing system of claim **6**, wherein OAG**2** and OAG**3** satisfy with the following condition: OAG**2**=OAG**3**.

8. The optical image capturing system of claim **1**, wherein TV distortion for image formation in the optical image capturing system is TDT, a maximum height for image formation on the image plane perpendicular to the optical axis in the optical image capturing system is denoted by HOI, a lateral aberration of the longest operation wavelength of a visible light of a positive direction tangential fan of the optical image capturing system passing through an edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as PLTA, and a lateral aberration of the shortest operation wavelength of a visible light of the positive direction tangential fan of the optical image capturing system passing through the edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as PSTA, a lateral aberration of the longest operation wavelength of a visible light of a negative direction tangential fan of the optical image capturing system passing through the edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as NLTA, a lateral aberration of the shortest operation wavelength of a visible light of a negative direction tangential fan of the optical image capturing system passing through the edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as NSTA, a lateral aberration of the longest operation wavelength of a visible light of a sagittal fan of the optical image capturing system passing through the edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as SLTA, a lateral aberration of the shortest operation wavelength of a visible light of the sagittal fan of the optical image capturing system passing through the edge of the entrance pupil and incident on the image plane by 0.7 HOI is denoted as SSTA; the following conditions are satisfied: PLTA≤200 μm, PSTA≤200 μm, NLTA≤200 μm, NSTA≤200 μm, SLTA≤200 μm and SSTA≤200 μm; |TDT|<250%.

9. The optical image capturing system of claim **1**, further comprising an aperture stop, wherein a distance from the aperture stop to the image plane on the optical axis is InS, and the following condition is satisfied: 0.2≤InS/HOS≤1.1.

10. An optical image capturing system, from an object side to an image side, comprising:

a first lens element with refractive power and having a first bearing surface of image side on the image side thereof;

a second lens element with refractive power and having a second bearing surface of object side on the object-side surface thereof and a second bearing surface of image side on the image-side surface thereof; and the second bearing surface of object side contacting with the first bearing surface of image side;

a third lens element with refractive power and having a third bearing surface of object side on the object-side surface thereof and a third bearing surface of image side on the image-side surface thereof; and the third bearing surface of object side contacting with the second bearing surface of image side;

a fourth lens element with refractive power; and

an image plane;

wherein the optical image capturing system comprises four lens elements with refractive powers, extension lines of the first bearing surface of image side to the second bearing surface of image side intersect with the optical axis intersects to form angles IAG, which are denoted as IAG**1** and IAG**2**, respectively; extension lines of the second bearing surface of object side to the third bearing surface of object side intersect with the optical axis to form angles OAG, which are denoted as OAG**2** and OAG**3**, respectively; at least one lens element among the first through fourth lens elements has positive refractive power, focal lengths of the first through fourth lens elements are f**1**, f**2**, f**3** and f**4** respectively, a focal length of the optical image capturing system is f, an entrance pupil diameter of the optical image capturing system is HEP, a distance on an optical axis from an object-side surface of the first lens element to the image plane is HOS, a distance on an optical axis from the object-side surface of the first lens element to the image-side surface of the fourth lens element is InTL, half of a maximum view angle of the optical image capturing system is HAF, a length of outline curve from an axial point on any surface of any one of the four lens elements to a coordinate point of vertical height with a distance of a half of the entrance pupil diameter from the optical axis on the surface along an outline of the surface is denoted as ARE, and the following conditions are satisfied: 0 deg<IAG≤90 deg; 0 deg<OAG≤90 deg; 1.0≤f/HEP≤10.0; 0 deg<HAF≤150 deg and 0.9≤2(ARE/HEP)≤2.0.

11. The optical image capturing system of claim **10**, wherein IAG**1** and IAG**2** satisfy with the following condition: IAG**1**=IAG**2**.

12. The optical image capturing system of claim **10**, wherein OAG**2** and OAG**3** satisfy with the following condition: OAG**2**=OAG**3**.

13. The optical image capturing system of claim **10**, wherein the following conditions are satisfied: 0 deg<IAG≤45 deg and 0 deg<OAG≤45 deg.

14. The optical image capturing system of claim **10**, the image plane is a plane or a curved surface.

15. The optical image capturing system of claim **10**, wherein a length of outline curve from an axial point on the object-side surface of the fourth lens element to a coordinate point of vertical height with a distance of a half of the entrance pupil diameter from the optical axis on the surface along an outline of the surface is denoted as ARE**41**; a length of outline curve from an axial point on the image-side surface of the fourth lens element to the coordinate point of vertical height with the distance of a half of the entrance pupil diameter from the optical axis on the surface along the outline of the surface is denoted as ARE**42**, and a thickness of the fourth lens element on the optical axis is TP**4**, and the following conditions are satisfied: 0.5≤ARE**41**/TP**4**≤15 and 0.5≤ARE**42**/TP**4**≤15.

16. The optical image capturing system of claim **10**, wherein a maximum effective half diameter position of any surface of any one of the four lens elements is denoted as EHD, and a length of outline curve from an axial point on any surface of any one of the four lens elements to the maximum effective half diameter position of the surface along the outline of the surface is denoted as ARS, and the following condition is satisfied: 0.9≤ARS/EHD≤2.0.

17. The optical image capturing system of claim **10**, wherein a distance between the third lens element and the fourth lens element on the optical axis is IN**34**, and the following condition is satisfied: 0<IN**34**/f≤5.0.

18. The optical image capturing system of claim **10**, wherein the distance from the third lens element to the fourth lens element on the optical axis is IN**34**, a thickness of the third lens element and a thickness of the fourth lens element on the optical axis respectively are TP**3** and TP**4**, and the following condition is satisfied: 1≤(TP**4**+IN**34**)/TP**3**≤10.

19. The optical image capturing system of claim **10**, wherein at least one lens element among the first lens element, the second lens element, the third lens element and the fourth lens elements is a light filtration element which filters light with wavelength of less than 500 nm.

20. An optical image capturing system, from an object side to an image side, comprising:

a first lens element with refractive power and having a first bearing surface of image side on the image-side surface thereof;

a second lens element with refractive power and having a second bearing surface of object side on the object-side surface thereof and a second bearing surface of image side on the image-side surface thereof; and the second bearing surface of object side contacting with the first bearing surface of image side;

a third lens element with refractive power and having a third bearing surface of object side on the object-side surface thereof and a third bearing surface of image side on the image-side surface thereof; and the third bearing surface of object side contacting with the second bearing surface of image side;

a fourth lens element with positive refractive power and having a fourth bearing surface of object side on the object-side surface thereof and a fourth bearing surface of image side on the image-side surface thereof; and the fourth bearing surface of object side contacting with the third bearing surface of image side; and

an image plane;

wherein the optical image capturing system comprises four lens elements with refractive powers, extension lines of the first bearing surface of image side to the third bearing surface of image side intersect with the optical axis to form angles IAG, which are denoted as IAG**1**, IAG**2** and IAG**3**, respectively; extension lines of the second bearing surface of image side to the fourth bearing surface of image side intersect with the optical axis to form angles OAG, which are denoted as OAG**2**, OAG **3**, and OAG**4**, respectively; at least one lens element among the first through fourth lens elements has positive refractive power, focal lengths of the first through fourth lens elements are f**1**, f**2**, f**3** and f**4** respectively; a focal length of the optical image capturing system is f, an entrance pupil diameter of the optical image capturing system is HEP; a distance on an optical axis from an object-side surface of the first lens element to the image plane is HOS; a distance on an optical axis from the object-side surface of the first lens element to the image-side surface of the fourth lens element is InTL, half of maximum view angle of the optical image capturing system is HAF; a length of outline curve from an axial point on any surface of any one of the four lens elements to a coordinate point of vertical height with a distance of a half of the entrance pupil diameter from the optical axis on the surface along an outline of the surface is denoted as ARE; and the following conditions are satisfied: 0 deg<IAG≤45 deg; 0 deg<OAG≤45 deg; 1.0≤f/HEP≤10; 0 deg<HAF≤150 deg; and 0.9≤2(ARE/HEP)≤2.0.

21. The optical image capturing system of claim **20**, wherein the extension lines of the first bearing surface of image side to the third bearing surface of image side and the extension lines of the second bearing surface of object side to the fourth bearing surface of object side extend towards the object side and intersect with the optical axis.

22. The optical image capturing system of claim **20**, wherein the extension lines of the first bearing surface of image side to the third bearing surface of image side and the extension lines of the second bearing surface of object side to the fourth bearing surface of object side extend towards the image plane and intersect with the optical axis.

23. The optical image capturing system of claim **20**, wherein the bearing surface of image sides and the bearing surface of object sides have a radial length of BSL, and the following condition is satisfied: 0.01 mm≤BSL≤1 mm.

24. The optical image capturing system of claim **20**, wherein a maximum effective half diameter position of any surface of any one of the four lens elements is denoted as EHD, and a length of outline curve from an axial point on any surface of any one of the four lens elements to the maximum effective half diameter position of the surface along the outline of the surface is denoted as ARS, and the following condition is satisfied: 0.9≤ARS/EHD≤2.0.

25. The optical image capturing system of claim **20**, further comprising an aperture stop, an image sensing device and a driving module, the image sensing device is disposed on the image plane, a distance from the aperture stop to the image plane on the optical axis is InS, the driving module is capable of coupling with the four lens elements and drive movements of the four lens elements, and the following condition is satisfied: 0.2≤InS/HOS≤1.1.

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